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# Notes on the Asclepiadaceae of China

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ABSTRACT. This paper is a precursor to the account of the Asclepiadaceae in the *Flora of China*. A new genus and species, *Sichuania alterniloba*, is described. Twenty-four new species are described in *Biondia* (*B. crassipes*, *B. laxa*, *B. parviurnula*, *B. revoluta*, and *B. tsiukowensis*), *Ceropegia* (*C. sinoerecta*), *Cynanchum* (*C. bicampanulatum*, *C. brevicoronatum*, *C. duclouxii*, *C. kingdonwardii*, *C. longipedunculatum*, *C. megalanthum*, *C. pingshanicum*, *C. rockii*, and *C. sinoracemosum*), *Hoya* (*H. commutata* and *H. mekongensis*), *Marsdenia* (*M. brachyloba*, *M. tenii*, and *M. yuei*), and *Tylophora* (*T. forrestii*, *T. rockii*, *T. tuberculata*, and *T. uncinata*). *Jasminanthes* is resurrected. Eleven new combinations are proposed in *Ceropegia* (*C. exigua*), *Cynanchum* (*C. boudieri* subsp. *caudatum*), *Heterostemma* (*H. menghaiense*), *Hoya* (*H. chinghungensis*), *Jasminanthes* (*J. chunii*, *J. mucronata*, *J. pilosa*, and *J. saxatilis*), and *Tylophora* (*T. costantiniana*, *T. oligophylla*, and *T. tsiangii*). The new name *Cynanchum triangulare* is proposed to replace *C. deltoideum* Hooker, not Hance. New synonymy is proposed in *Cynanchum*, *Lygisma*, *Marsdenia*, and *Tylophora*. The status of *Merrillanthus* is discussed.

The following new taxa and new combinations are required for the forthcoming account of the Asclepiadaceae for the *Flora of China*. Some new synonymy is also presented. The taxa are arranged alphabetically.

**Biondia** Schlechter.

*Biondia*, a genus of 13 species endemic to China, is characterized by narrow leaves with minute pale dots on the adaxial surfaces, small flowers mostly with well-developed corolla tubes, and reduced, often annular, coronas. Such leaf dots are also seen in some species of *Tylophora*, but they have restricted occurrence in genera related to *Biondia*. The most important exception is *Cynanchum thesioides* K. Schumann, which also has narrow leaves. This species is somewhat isolated in *Cynanchum* and has been placed in its own genus, *Rhodostegiella* C. Y. Wu & D. Z. Li. There is perhaps a case for regarding it as a *Biondia* with a more normally developed corona than usual.

Most species of *Biondia* are too poorly represented in herbaria to establish patterns of variation, and it is difficult to have much confidence in species delimitation. A number of collections cannot be placed within the known range of variation of existing taxa. These are herein described as distinct species. It is likely that more information on variation within spe-

cies will require a reassessment of the number of species recognized.

**Biondia crassipes** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Sichuan: Yiajiang Xian, 2700 m, 10 Sep. 1977, *B. Z. Guo & W. Y. Wang 23624* (holotype, HNWP 88274).

Species nova *Biondiae tsiukowensi* M. G. Gilbert & P. T. Li similis sed ab ea foliis angustatis nervatione laterali non prominenti, rachidibus inflorescentiarum plus minusve pedicellos aequantibus, rachillis cymularum elongatis plus minusve incrassatis differt.

Twining herbs. Stems puberulent along 2 sides and at nodes. Petioles 2–4 mm, adaxially densely puberulent; leaf blades linear-oblong, to 5 × 0.3 cm, paler abaxially, base cuneate, apex acute; midrib raised adaxially, lateral veins obscure, glabrous. Inflorescences 2–3.5 cm, mostly with two cymules separated by a rachis ca. as long as pedicels; rachillas of cymules slightly elongated and ± fleshy, very sparsely puberulent. Pedicels 6–10 mm. Sepals elliptic, ca. 1.5 × 0.6 mm, sparsely puberulent. Corollas apparently green, bell-shaped, 2.5 mm, exterior glabrous, interior minutely hairy, hairs short, stiff, white; tube ca. 1.5 mm; lobes triangular, revolute, twisted. Coronas reduced to inconspicuous collar concealing bases of anthers. Pollinia oblong-reniform. Follicles solitary, narrowly fusiform, ca. 5.5 × 0.4 mm.

The narrow leaves and small flowers of *Biondia crassipes* suggest a relationship to *B. longipes* P. T. Li and *B. revoluta*. The corolla form is most similar to those of *B. microcentra* (Tsiang) P. T. Li and *B. tsiukowensis*, while the lax inflorescence is similar to that in *B. laxa*. *Biondia crassipes* differs from all other species of *Biondia* by the slightly elongated and distinctly thickened rachillas of the cymules; all other species have contracted umbelliform cymules. *Biondia longipes* differs further from *B. crassipes* by the glabrous corollas, while *B. revoluta* differs by the longer and more distinctly tubular corollas.

**Biondia laxa** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: Ouei cha (Yunpe), 13 May 1920, *Tĕn 404* (holotype, E).

Species nova *Biondiae insigni* Tsiang similis sed ab ea foliorum nervis lateralibus utroque costae latere 4–6, omnibus similibus, rachidi inflorescentiae longa cymulas plerumque 3 gerente differt.

Twining herbs. Stems densely pubescent along 2 sides. Petioles to 7 mm; leaf blades lanceolate, 4.5–6 × 1.2–2 cm, glabrous, base rounded, apex acute; lateral veins 4–6 pairs, at ca. 45° to midrib, all similar, adaxially slightly raised and minutely puberulent. Cymes extra-axillary; peduncles to 2.5 cm, glabrous; cymules umbel-like, up to 3 along zigzag rachis to 2 cm. Pedicels 1–1.3 cm, very slender. Sepals ovate, ca. 1 × 0.5 mm, glabrous or sparsely pilose on margins. Corolla tubes bowl-shaped, ca. 1 mm, much shorter than lobes; lobes triangular-acuminate, ca. 2.5 mm, revolute, apex twisted, very minutely puberulent. Coronas ± annular with fleshy, square to ± rounded lobes to base of anthers. Gynostegium slightly exserted from corolla tube; pollinia cylindric, as long as corpusculum. Fruits not seen.

*Biondia laxa* is immediately separable from all other members of the genus by the inflorescence, which has a distinct rachis to 2 cm long and up to three separate umbel-like cymules. Older leaves have thick, pale veins very similar to those of the closely related *B. insignis*. However, *B. insignis* has a distinctive leaf venation with two major lateral veins at an acute angle to the midrib, as well as up to eight pairs of minor veins at a wider angle. *Biondia insignis* also differs by the ringlike corona.

*Paratypes.* CHINA. **Xizang (Tibet):** Rong Tö Valley, Layul, 1800 m, 20 Apr. 1933, *Kingdon-Ward 10352* (BM). **Yunnan:** Lao Kouy Chan, near My lé, 1906, *P. Ngueou* in *Ducloux 4171* (P); Shweli–Salwin Divide at 25°30′N, 2700 m, Aug. 1917, *Forrest 15718* (BM, E).

**Biondia parviurnula** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Anhui: Jinzhai, Guan Cai Gou, Bai Ma Zhai, 800 m, 4 Mar. 1984, *K. Yao 8956* (holotype, A; isotype, K).

Species nova *Biondiae hemsleyanae* (Warburg) Tsiang similis sed ab ea nervatione foliorum prominentiore, inflorescentiis minimis, corollis minoribus urceolatis differt.

Twining herbs. Stems densely minutely puberulent along 2 sides. Petioles to 7 mm, adaxially puberulent; leaf blades lanceolate, to 6.5 × 2.2 cm, base rounded, apex acute-apiculate, glabrous except for adaxially densely puberulent midrib; lateral veins 3 or 4 pairs, slightly raised on both sides; upper leaves relatively narrower, ± elliptic to elliptic-oblong. Inflorescences umbel-like, ca. 4-flowered; peduncles ca. 2 mm, puberulent. Pedicels 1.5–2 mm, glabrous. Sepals lanceolate, ca. 1.5 × 0.7 mm, apex acute, pubescent, somewhat glabrescent. Corollas urn-shaped, 3–3.5 mm, interior pale purple, exterior glabrous; tube ca. 2.5 × 2 mm, throat ca. 1.2 mm wide, interior sparsely hairy; lobes ovate, ca. 1.2 mm, apparently not revolute. Corona a collar covering bases of anthers, thin when dried. Stigma head conical. Fruits not seen.

The type of *Biondia parviurnula* was identified as *B. hemsleyana*, but *B. parviurnula* is readily distinguished by having leaves with more prominent venation, very small inflorescences (less than 1 cm long), and smaller, more distinctly urn-shaped corollas. The corolla of *B. parviurnula* is most similar to those of *B. microcentra* and *B. yunnanensis* (H. Léveillé) Tsiang but is glabrous inside. The type material also differs from those species by having internodes with two lines of pubescence.

**Biondia revoluta** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. NW Yunnan/E Xizang (Tibet): Tung-chu-ling, 3000 m, May 1913, *Kingdon-Ward 310* (holotype, E).

Species nova *Biondiae pilosae* P. T. Li similis sed ab ea internodiis bilateraliter pubescentibus, foliis manifeste revolutis nervatione laterali prominentiore, pedicellis longioribus differt; a speciebus aliis lobis corollarum tubum aequantibus differt.

Twining herbs. Stems hairy along 2 sides. Petioles to 3.5 mm, puberulent; leaf blades linear-oblong, to 2.8–6 × 0.4–0.55 cm, base ± rounded, margins strongly revolute, apex subacute, apiculate, glabrous except for adaxial midrib, lateral veins not raised, underside distinctly paler, wrinkled when dried, probably fleshy when fresh. Peduncles 1–1.5 cm, hairy along 1 side; cymules umbel-like, 2–4-flowered, solitary or 2 separated by rachis to 5 mm, puberulent. Pedicels 7–9 mm, glabrous. Sepals ovate, 0.7–1 × 0.5–0.7 mm, sparsely puberulent, apex acute. Corollas bell-shaped, inside minutely puberulent, 2.5–3.5 mm, lobes ovate, ca. 1.5 × 1.5 mm, apex rounded, slightly revolute. Coronas annular, obscurely 5-toothed. Fruits not seen.

*Biondia revoluta* is most closely related to *B. pilosa*, which differs by having internodes with only one line of hairs, leaves with acuminate apices and more conspicuous lateral veins, and shorter peduncles. The collection from Gansu (*Wang 19120*) has smaller leaves and flowers than the type collection, and the lateral leaf veins are distinctly darker than the lamina and are not raised. In all other respects, it is a good match and is included here as a paratype despite the disjunct distribution.

*Paratype.* CHINA. **Gansu:** Wen Xian, 1500 m, 30 Apr. 1966, *Z. B. Wang 19120* (HNWP).

**Biondia tsiukowensis** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: Salween–Mekong Divide, Tsiu kow, 2400 m, May 1911, *Kingdon-Ward 110* (holotype, E).

Species nova *Biondiae microcentrae* similis sed ab ea internodiis bilateraliter pubescentibus, pedunculis longioribus, lobis corollinis ca. ⅞ partes longitudinis tubi aequantibus differt.

Twining herbs. Stems densely pubescent along 2 sides. Petioles ca. 6 mm, adaxially puberulent; leaf blades lanceolate, ca. 6 × 1.2 cm, glabrous except for veins, base rounded, apex ± acute, slightly apiculate; lateral veins 5–7 pairs, adaxially slightly raised and minutely puberulent, at an acute angle to midrib. Cymes umbel-like; peduncles 2–18 mm, almost glabrous. Pedicels to 11 mm. Sepals ovate, ca. 1.4 × 0.7 mm, glabrous. Corolla tube bell-shaped, ca. 2.3 mm long, longer than lobes; lobes triangular-acuminate, 2 × 1.4 mm, revolute toward apex, minutely puberulent inside. Corona lobes ± square, reaching base of anthers. Gynostegium ca. 1.4 mm high; pollinia cylindrical, as long as corpusculum. Fruits not seen.

*Biondia tsiukowensis* is distinguished from other species of *Biondia* by having longer peduncles and corolla lobes only slightly shorter than the tube. Other species of *Biondia* have corolla lobes either less than half as long as or distinctly longer than the corolla tube. It also differs by its more or less square corona lobes that reach the bases of anthers. *Biondia microcentra* is in some ways most similar because it also has the lateral veins of the leaves raised adaxially and a hairy interior to the corolla, but it differs markedly by having much shorter (to 4 mm) peduncles and pedicels.

**Ceropegia** L.

*Ceropegia*, which includes about 170 species mostly in Africa, is represented in China by 17 species.

**Ceropegia exigua** (Huber) M. G. Gilbert & P. T. Li, comb. et stat. nov. Basionym: *Ceropegia longifolia* Wallich subsp. *exigua* Huber, Mem. Soc. Brot. 12: 42. 1957. TYPE: China. Sichuan: Tung Valley, *Wilson 4112* (holotype, BM; isotypes, K, P).

*Ceropegia exigua* is perhaps the most distinctive member of the *C. longifolia* Wallich complex. It can be recognized instantly by the very short corolla lobes, which are abruptly contracted from the prominently spreading top of the corolla tube to form a short narrow beak, even when the flower is fully open. The corolla lobes in the other members of this group are much longer (usually at least three-fourths as long as the corolla tube, sometimes longer), and the upper part of the tube does not spread and

passes much more gradually into the lobes, which are not abruptly contracted into a beak. Furthermore, in *C. exigua* the corolla lobes are only slightly darker than the rest of the corolla and are quite coarsely pilose, while in the rest of the complex, as in many other species in the genus, the corolla lobes are deeply colored and finely and densely pubescent, contrasting greatly with the rest of the corolla.

**Ceropegia sinoerecta** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: au pied du Hee Chan men (Ho Kin), 2000 m, 30 May 1887, *Delavay 2625* (holotype, P).

Species nova *Ceropegiae mairei* (H. Léveillé) Huber similis sed ab ea corollae angustioris basi quam ostio latiore lobis linearibus fere ad basim atratis manifeste differt; a *C. wallichii* White partibus omnibus gracilioribus differt.

Erect herbs. Rootstock a cluster of fusiform roots. Stems erect, to 20 cm, uniformly finely puberulent. Petioles 4–6 mm, narrowly winged; leaf blades elliptic, 2–5 × 0.6–1.6 cm, base cuneate, apex acute, lowermost leaves sometimes cuspidate, abaxially pale and sparsely hairy on veins only, adaxially densely puberulent. Peduncles 4–17 mm. Cymules umbel-like, 2–4-flowered, sometimes producing a second cymule separated by a short rachis. Pedicels 5–17 mm. Sepals linear-lanceolate, ca. 3 × 0.6 mm, glabrous. Corollas 3.6–4.3 cm, glabrous except for lobes, tube dark for basal half, pale for apical half, basal swelling ovoid, 4–6 mm wide, tube 1.3–1.6 mm wide, increasing gradually to 3.5–5.5 mm at base of lobes; lobes darkly colored almost to base, minutely puberulent, 14–15 mm, linear, slightly curved inward at base, otherwise parallel except for sharply incurved tip. Outer corona lobes each with 2 linear teeth ca. 1.5 mm, ciliate; inner corona lobes linear, ca. 2.5 mm, erect. Fruits not seen.

*Ceropegia sinoerecta* is perhaps most closely related to *C. mairei*, from which it differs by the more slender flowers widest at the basal inflation and by the differentiated corolla tips extending almost to the base of the lobes instead of less than halfway down. *Ceropegia wallichii* White (Nepal and western Himalayas), which also has erect stems and similarly shaped corollas, is a robust plant with unusually thick stems and much larger leaves and flowers, whereas *C. sinoerecta* is delicate in all features.

The holotype has simple umbel-like inflorescences and parallel corolla lobes, while the paratype has inflorescences with pairs of umbels separated by a distinct rachis and corolla lobes bowing slightly outward. More collections are needed to properly assess the significance of these differences. There are several other collections by Delavay numbered as 2625, but these differ in details of date and locality, and all belong to *C. mairei*.

*Paratype.* CHINA. **Yunnan:** Kou ty près Pin tchouay, Apr. 1907, *Jean Py* in *Ducloux 5305* (P).

## **Cynanchum** L.

With 57 species, *Cynanchum* is the largest and most difficult genus of Chinese asclepiads. It is being treated here in the wider sense, i.e., including *Vincetoxicum* N. M. Wolf, *Cyathella* Decaisne, and *Rhodostegiella*. When the group as a whole is considered, it is currently not possible to define adequate discontinuities among the potential segregate genera.

**Cynanchum acutum** L. subsp. **sibiricum** (Willdenow) F. Rechinger, Fl. Iranica, Asclepiadaceae 9. 1970. *Cynanchum sibiricum* Willdenow, Ges. Naturf. Freunde Berlin Neue Schriften 2: 124. 1799. TYPE: B-WILLD 5233 (microfiche).

*Cynanchum cathayense* Tsiang & Zhang, Acta Phytotax. Sin. 12: 110. 1974. Syn. nov. *Cyathella cathayensis* (Tsiang & Zhang) C. Y. Wu & D. Z. Li, Acta Phytotax. Sin. 28: 465. 1990. TYPE: China. Gansu: Chiu-Chuan Hsien, 1350 m, 2 Dec. 1956, *R. C. Ching 30* (PE).

*Cynanchum cathayense* was not compared with *C. acutum* in the protologue. Numerous collections from Xinjiang match the description of *C. cathayense* and are not separable from *C. acutum* subsp. *sibiricum*. There seems to be no alternative but to include *C. cathayense* in that taxon.

*Cynanchum acutum* L. subsp. *acutum* is widespread in the Mediterranean region from Spain east to Turkey, where there is an area of overlap with *C. acutum* subsp. *sibiricum*. It differs by the ovate leaves with convex rather than concave sides, but individuals with hastate leaves are found from throughout the range, and it does not seem possible to treat the two as species.

**Cynanchum ascyrifolium** (Franchet & Savatier) Matsumura, Ind. Pl. Jap. 2, 2: 509. 1912. *Vincetoxicum ascyrifolium* Franchet & Savatier, Enum. Pl. Jap. 2: 441. 1879. TYPE: "prob. ins. Nippon, cum *V. multinerve* mixtum, ex Tanaka accepit Dr. Savatier" (holotype, P).

*Cynanchum ascyrifolium* has been used widely recently in both Japan and China for a very distinctive erect plant with large membranous acuminate leaves and small inflorescences. Unfortunately,

the type of *C. ascyrifolium* is a plant with oblong-elliptic leaves with a thick texture and rounded-apiculate tips. It is clearly different from any other species known to us. The correct name for most material commonly included under *C. ascyrifolium* is *C. acuminatifolium* Hemsley.

**Cynanchum auriculatum** Royle ex Wight, Contr. Bot. India 58. 1834. SYNTYPES: India. Kamoun, *Wallich 8228* ("asclep. 137") (K-WALL); Kimour, *Royle s.n.* (LIV not seen).

*Cynanchum saccatum* W. T. Wang in Tsiang & P. T. Li, Acta Phytotax. Sin. 12: 91. 1974. Syn. nov. TYPE: China. Xizang (Tibet): Chang-Tu, Chi-na-tung, Tsa-wa-rung, 3000 m, Aug. 1935, *C. W. Wang 65215* (holotype, IBSC).

*Cynanchum saccatum* was described without the examination of authentic material of *C. auriculatum*, from which it is indistinguishable. Specimens of *C. boudieri* were often misidentified as *C. auriculatum*, but *C. boudieri* has strongly reflexed corollas, whereas *C. auriculatum* has rotate corolla lobes.

**Cynanchum bicampanulatum** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Sichuan: Kangting (Tachienlu), 2700 m, 11 July 1934, *Harry Smith 10443* (holotype, UPS; isotypes, MO, S).

Species *Cynancho vincetoxico* sensu lato affinis sed ab eo corollis coronisque campanulatis, lobulis coronae ad antheras corollasque adnatis facile distinguenda.

Herbs. Roots many, little branched, fleshy. Stems forming fairly dense cluster, little branched, erect or ascending, to 30 cm, minutely puberulent mainly along 2 sides. Petioles 3–9 mm; leaf blades oblong-ovate, 5.5–7 × 4–4.5 cm, base shallowly cordate, truncate or rounded, apex acute to slightly acuminate; basal veins 5–7, lateral veins 4 or 5 pairs, glabrous or minutely puberulent on some. Inflorescences ± umbel-like, cymules several flowered, separated by a very short rachis; peduncles (5–)8–18 mm, puberulent; bracts linear, 0.9–2 mm. Pedicels 5–8 mm (to 12 mm in fruit), puberulent. Sepals oblong, ca. 1.5 × 0.5 mm, apex rounded, almost glabrous. Corollas bell-shaped, ca. 4 mm; glabrous except for a few stiff hairs within tube, purple (fide *Guo & Wang 21046*); tube ca. 2 × 3 mm; lobes oblong-ovate, ca. 1.7 × 1.5 mm, apex rounded, usually revolute. Corona tube ± as high as anthers, membranous with inflexed, rounded, fleshy lobes, adnate to corolla tube and to anthers opposite lobes. Anthers square, slightly gibbous; anther appendage ovate, inflexed over stigma head; pollinia ovoid, ca. 0.2 mm. Stigma head dark, rounded. Follicles paired or solitary, spreading, glabrous, beaked-fusiform, at least 3.5 × 1.5 cm.

*Distribution and ecology*. China, Gansu and Sichuan Provinces. In open fields ("prato aprico"); 2570–2700 m.

At first glance *Cynanchum bicampanulatum* looks very similar to some of the forms of *C. forrestii* Schlechter, a member of the *C. vincetoxicum* (L.) Persoon complex. However, in *C. bicampanulatum* the corolla and corona are campanulate, in contrast to the shallow-tubed, rotate corolla and bowl-shaped corona of members of that complex. *Cynanchum stenophyllum* Hemsley resembles *C. bicampanulatum* in having the corona adnate to both the anthers and corolla tube but differs in having narrow leaves and almost no indumentum.

*Paratypes*. CHINA. **Gansu:** Erh-lau-shan ad Minchow, 2570 m, 30 June 1930 (fl), *Hummel 3894* (S); Minchow, 2410 m, 8 Sep. 1930 (fr), *Hummel 5097* (S). **Sichuan:** Daofu Xian, 5 July 1977 (fl), *Guo & Wang 20861 & 21046* (HNWP).

**Cynanchum boudieri** H. Léveillé & Vaniot, Bull. Soc. Bot. France 51: CXLIV. 1904. TYPE: China. Sichuan: Kouy-Tchéou, Pin-fa, ruisseau du Tu-chang, 5 Oct. 1902, *Cavalerie 620* (holotype, E).

*Cynanchum amphibolum* C. K. Schneider in Sargent, Pl. Wils. 3: 346. 1916. Syn. nov. TYPE: China. Hubei Province: Patung Hsien, Aug. 1907, *Wilson 2247* (holotype, A; isotype, K).

**Cynanchum boudieri** subsp. **caudatum** (Miquel) P. T. Li, M. G. Gilbert & W. D. Stevens, comb. et stat. nov. Basionym: *Endotropis caudata* Miquel, Ann. Mus. Bot. Lugduno-Batavum 2: 128. 1866. TYPE: Japan, *Keiske* (?) (not seen).

The Chinese material of *Cynanchum boudieri*, which has often been misidentified as *C. auriculatum*, has elongated inflorescences, whereas the Japanese collections have umbelliform inflorescences. Plants of the two countries are otherwise very similar, and they are best treated as subspecies.

**Cynanchum brevicoronatum** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Hubei (Hupeh): Ichang, *A. Henry 6418* (holotype, BM; isotypes, K, P).

Species *Cynancho wallichii* similis sed ab eo calyce reflexo corona brevissima cupuliformi membranacea integra appendicibus carente facile distinguenda.

Twining herbs. Stems puberulent along 1 line. Petioles to 3 cm; leaf blades abaxially slightly glaucous, ovate or ovate-triangular, 6–7.5 × 3–4.2 cm, base cordate, apex acute to slightly acuminate, basal lobes ± incurved, adaxially very sparsely and minutely hairy, abaxially puberulent on veins, sometimes pale gray-green; basal veins 3(–5), lateral veins 2 or 3 pairs; axils often with reduced stipule-like shoots. Inflorescences simple, shortly and densely raceme-like, to 1.5 cm; peduncles 1–5 mm, puberulent; cymules 2-flowered. Pedicels to 5.5 mm, pubescent. Sepals lanceolate, ca. 1.5 × 0.7 mm, ciliate, minutely puberulent outside, strongly reflexed at anthesis. Corollas ± erect, lobes oblong-ovate, ca. 3.5 × 1.7 mm, slightly fleshy, glabrous. Coronas a shallow ± membranous cup ca. half as high as gynostegium, internal appendages absent. Gynostegium ca. 2.5 mm high; anther appendages ovate, acute. Follicles often solitary, lanceolate in outline, ca. 6 × 1.5 cm.

*Distribution.* China in the provinces of Hubei and Sichuan. There is no information on ecology.

The corona in *Cynanchum brevicoronatum* is so short that at one point it was suspected to be a growth abnormality, but the flowers seem uniform and fully functional. Initially *C. brevicoronatum* was confused with *C. decipiens*, which also has a short corona, but closer examination shows that the corona is much shorter, membranous rather than fleshy, and lacks the inner appendages seen in *C. decipiens*. Another distinctive feature of *C. brevicoronatum* is the reflexed sepals. It is probably most closely related to species such as *C. wallichii* Wight and *C. callialatum* Hamilton ex Wight. Similar very short coronas are seen in *Biondia*, which can easily be distinguished by the much narrower leaves with pale dots on the adaxial surface and the distinctly fleshy corona.

*Paratype.* CHINA. **E Sichuan:** Tchen-kéou-tin, *Farges 92 bis* (P).

**Cynanchum duclouxii** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: Yunnansen, 3 Aug. 1904, *Ducloux 176* (holotype, E).

Species *Cynancho kintungensi* similis sed ab eo corolla parva lobis erectis, corona brevioribus differt, ab speciebus aliis appendicibus coronae parvis vel reductis plus minusve minute longitudinaliter bicarinatis pilis caulium unifariis distinguenda.

Twining herbs. Stems puberulent along 1 line. Petioles 2.5–3.2 cm; leaf blades triangular-ovate, 4.5–8 × 1.7–5.1 cm, adaxially uniformly minutely puberulent, abaxially slightly paler and glabrous except for puberulent veins, base deeply cordate, basal lobes slightly enlarged, sometimes overlapping, apex acute to slightly acuminate, basal veins 3–5, pedate, lateral veins 2 or 3 pairs. Inflorescences raceme-like, sometimes terminal on short axillary branches; peduncles 0.7–5.5 cm; rachis to 1.5 cm; cymules 2-flowered, in a lax spiral. Pedicels to 6 mm, puberulent. Sepals ovate, ca. 1 × 0.8 mm, sparsely puberulent, apex acute. Corollas white, ± erect, deeply divided, lobes 2.5–3 × 1–1.4 mm, glabrous outside, minutely puberulent inside. Coronas membranous, prominently 5-lobed, tube ca. as high as middle of anthers, shorter than lobes; lobes longer than anther appendages, often inflexed, with 2 prominent adaxial gibbosities at base, rarely with a small adaxial appendage. Anther appendages ovate, acute, prominent. Follicles solitary, lanceolate in outline, ca. 6.5 × 0.9 cm, base tapered, apex slightly acuminate.

*Distribution.* China, Yunnan and Sichuan Provinces. Bushland in valleys; no indication of altitude.

*Cynanchum duclouxii* is related to *C. wallichii* Wight, *C. sinoracemosum* M. G. Gilbert & P. T. Li, and *C. kintungense* Tsiang. From these, *C. duclouxii* is separated by its smaller flowers with erect corolla lobes and its coronas, which are shorter than the anthers. In *C. wallichii* the corolla lobes are reflexed, whereas in *C. kintungense* they are spreading, and in both species the corona tube is longer than that of *C. duclouxii*. The characters separating *C. duclouxii* from *C. sinoracemosum* are listed under the latter.

*Paratypes.* CHINA. **Sichuan:** Tianquan Xian, Erlong Mountain, 14 Aug. 1953, *X. Y. Jiang 35246* (HNWP). **Yunnan:** Yunnansen, *E. E. Maire 1141* (E).

**Cynanchum kingdonwardii** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: Yungning, 29 June 1922, *Kingdon-Ward 5266* (holotype, E).

Species *Cynancho callialato* similis sed ab eo laminis foliaribus linearilanceolatis basibus cuneatis manifeste distinguenda.

Twining herbs. Internodes with poorly defined line of pubescence. Petioles to 11 mm; leaf blades linear-lanceolate, to at least 11 × 1.2 cm, adaxially thinly puberulent, abaxially glabrous, base cuneate, apex acute; lateral veins ca. 10 pairs. Inflorescences umbel-like; peduncles to 3 mm, pubescent along 1 side. Pedicels to 7 mm, puberulent. Sepals lanceolate, ca. 2 × 0.8 mm, thinly hairy. Corollas very pale green, deeply divided, glabrous; lobes oblong-lanceolate, ca. 5 × 2.4 mm, blunt. Coronas white, cup-shaped, ca. 2.5 mm high, membranous, adnate to anthers, mar-

gin with 5 low, acute teeth, smooth adaxially. Gynostegium slightly higher than corona; anther appendages narrowly ovate. Fruits not seen.

*Distribution and ecology.* China, Yunnan Province. On scrub-clad limestone slopes, in shade, at 3000–3300 m.

*Cynanchum kingdonwardii* resembles *C. callialatum* and *C. wallichii* in having cup-shaped coronas with reduced or no internal appendages. It differs from those and all related species by the linear-lanceolate leaf blades with cuneate bases, instead of more or less ovate blades with deeply cordate or sometimes rounded bases.

**Cynanchum longipedunculatum** M. G. Gilbert & P. T. Li, sp. nov. TYPE: "Western China," 12,000 ft. [3600 m], June 1904, *Wilson 4103* (holotype, BM; isotype, P).

Species *Cynancho decipienti* affinis sed ab eo inflorescentiis subcapitatis pedunculis longioribus corona longiore cupuliformi non carnosa differt.

Twining herbs. Stems puberulent along 1 side. Petioles ca. 2.5 cm, slender; leaf blades lanceolate, ca. 5.6 × 2.3 cm, adaxially uniformly puberulent, abaxially slightly glaucous, hairy on veins only, base deeply cordate with incurved, often overlapping, basal lobes, apex long-acuminate; basal veins usually 7, lateral veins 3 or 4 pairs. Inflorescences long pedunculate, umbel-like, very congested; peduncles 6–9 cm, longer than subtending leaf, densely hairy on 1 side; cymules usually all aggregated, sometimes an isolated flower below main inflorescence. Pedicels 3.5–6 mm, puberulent on 1 side. Sepals oblong-lanceolate, ca. 2 × 0.9 mm, puberulent, sometimes only on margins. Corollas white (fide Wilson), exterior glabrous, interior densely pilose, tube ca. 0.5 mm; lobes ca. 5.5 × 1.7 mm, ± erect. Coronas cup-shaped, longer than stigma head, not very fleshy, tube longer than triangular marginal lobes, interior with 5 internal appendages opposite to and nearly as long as marginal lobes. Anther appendages ovate, nearly acute, scarious except for narrow midrib, higher than corona. Stigma head rounded. Fruits not seen.

*Distribution.* Known only from the type collection without precise locality or notes on ecology apart from the unusually high altitude, 3600 m; most likely collected in Sichuan Province.

*Cynanchum longipedunculatum* differs from the related *C. decipiens* C. K. Schneider by having subcapitate inflorescences up to 2 cm in diameter and coronas longer than the gynostegium. *Cynanchum decipiens* has umbel-like inflorescences 3–15 cm long and corona shorter than the gynostegium.

**Cynanchum lysimachioides** Tsiang & P. T. Li, Acta Phytotax. Sin. 12: 89. 1974. TYPE: China. Yunnan: between Likiang, Youngnung & Yungpei, en route to Muli, *Rock 5317* (holotype, NY; isotype, E).

*Cynanchum likiangense* W. T. Wang in Tsiang & P. T. Li, Acta Phytotax. Sin. 12: 89. 1974. Syn. nov. TYPE: China. Yunnan: Li-Kiang, 6 Aug. 1939, *Y. C. Chao 21216* (holotype, KUN).

Comparison of the types of *Cynanchum lysimachioides* and *C. likiangense* shows that the supposed difference in habit, the one erect and the other twining, is not real because the habit is basically erect but with a distinct tendency toward twining. Other supposed differences in density and length of indumentum and flower size are well within the range found in many other species and seem unlikely to be of real significance.

**Cynanchum megalanthum** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: 20 mi. S of Yung-ning, 2700 m, 27 May 1921, *Kingdon-Ward 4103* (holotype, E).

Species *Cynancho corymboso* similis sed ab eo corolla magna parce pubescenti, coronae lobulis marginalibus deltatis tubo semper longioribus distinguenda.

Robust twining herbs. Stems puberulent along 1 (or 2) lines. Petioles ca. 2.5 cm; leaf blades triangular-ovate, ca. 8.5 × 4.8 cm, thinly papery, abaxially gray-green, minutely puberulent along veins, adaxially minutely puberulent, base deeply cordate, basal lobes rounded, not incurved, apex acute to acuminate; basal veins 5, lateral veins ca. 3 pairs. Inflorescences umbel-like or sometimes raceme-like with many-flowered cymules; peduncles robust, ca. 5 cm, thinly puberulent. Pedicels 10–14 mm, puberulent along 1 side. Sepals lanceolate, ca. 5 × 1.4 mm, sparsely and minutely puberulent. Corollas cream or pale greenish pink, deeply divided, rotate; lobes linear-lanceolate, ca. 10 × 2.2 mm, very sparsely hairy. Coronas cup-shaped, ca. 1 mm high, with 5 triangular marginal lobes to 3 mm high and small internal appendages. Anther appendages oval, incurved over stigma head. Fruits and seeds not seen.

*Distribution and ecology.* China (Yunnan Province), Myanmar. Along thicket margins; 2700 m.

*Cynanchum megalanthum* is superficially similar to *C. corymbosum* but with the corolla much larger and more sparsely hairy and with the corona tube

shorter than the well-defined triangular marginal lobes. The internal corona appendages are always small and sometimes more or less obsolete, suggesting a relationship also to *C. callialatum* and *C. duclouxii*, which show comparable variation.

*Paratypes*. CHINA. **Yunnan:** To ngay près Lou Pou préfecture de Cong tibouray, June 1906, *S. Ten* in *Ducloux 4143* (P). MYANMAR. *Forrest 10327* (E).

**Cynanchum pingshanicum** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. P'ing Chan, ca. 500 km S of Beijing, mountains SW of Nan Yéli, Mei-huei-t'ouo, 5 June 1923, *L. Chanet & J. H. Serre A178* (holotype, P).

Species *Cynancho acuminatifolio* Hemsley affinis sed ab eo paginis adaxialibus foliorum uniformiter puberulis, lobis corollae angustioribus, inflorescentiis longioribus differt.

Erect herbs. Stems 30–60 cm high, ± tending to twine at tip in larger plants; internodes at first pubescent, soon glabrescent. Lower and uppermost leaves reduced, other leaves larger; petioles 1–2 cm; leaf blades ovate to elliptic, 7.5–15 × 3.7–8.5 cm, adaxially uniformly puberulent, abaxially puberulent along veins, base cuneate to ± truncate and decurrent along petiole; veins 5–8 pairs. Inflorescences at upper nodes, up to 4 per node, uppermost usually longer than subtending leaf, irregularly forked to ± umbel-like, many flowered; peduncles 1–6.5 cm, glabrescent. Pedicels 6–9 mm, glabrous or sparsely puberulent. Sepals triangular-lanceolate, ca. 2 × 0.6–0.8 mm, glabrous except for ciliate margin. Corollas probably white, ca. 12 mm diam., glabrous; lobes oblong-triangular, ca. 6 × 2 mm, apex ± obtuse. Coronas fleshy, 5-lobed to near base, slightly shorter than anthers; lobes bluntly triangular, ± free from gynostegium, without internal appendages. Fruits not seen.

*Cynanchum pingshanicum*, which is closely related to *C. acuminatifolium* Hemsley and *C. japonicum* Morren & Decaisne, is known only from five collections all made by Chanet and Serre between 1923 and 1926. It differs from both of those species by the uniformly puberulent adaxial leaf surface, from *C. acuminatifolium* by the width of corolla lobes (2 vs. 3 mm wide), and from *C. japonicum* by the shorter inflorescences.

*Paratypes*. CHINA. P'ing Chan, Nan ye li, 1 June 1926, *L. Chanet & J. H. Serre A724* (P); P'ing Chan, Pai lin t'ong, 4 June 1926, *L. Chanet & J. H. Serre A722* (P); no data, *L. Chanet & J. H. Serre 15* (P); no data, *L. Chanet & J. H. Serre 1223* (P).

**Cynanchum rockii** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Sichuan: Muli, Mutirong, Muti Konka, snow range E of the Yalung, 3000 m, May–June 1932, *Rock 23718* (holotype, K; isotypes, BM, E, HUH).

Species *Cynancho vincetoxico* sensu lato affinis sed ab eo corolla atrorubenti lobis angustatis erectis glabris tubo interne lanato manifeste distinguenda.

Erect herbs. Stems 2, to 30 cm, branched, pubescent. Petioles 5–11 mm; leaf blades ovate, ca. 5 × 3 cm, adaxially sparsely pubescent, abaxially densely puberulent along veins, base rounded to broadly cuneate, apex acuminate; lateral veins 3 or 4 pairs. Inflorescences up to 7-flowered, slender, often forked with umbel-like clusters of flowers, to 3.6 cm; peduncles ca. 1.8 cm. Pedicels ca. 6 mm. Sepals lanceolate, ca. 2.2 × 0.5 mm. Corollas dark red, tube ca. 2 mm, lobes erect, ca. 4 × 1.5 mm, triangular-acuminate, apex blunt, glabrous except the throat with woolly hairs. Corona lobes almost free, ovate, higher than gynostegium, apex rounded, adnate to anther, without internal appendage. Fruits not seen.

*Distribution and ecology*. China, Sichuan. Alpine meadow; 3000 m.

The type of *Cynanchum rockii* was cited by Tsiang (1939) as *C. muliense* Tsiang. However, the type of *C. muliense* is clearly a member of the complex including *C. vincetoxicum*, *C. inamoenum* (Maximowicz) Loesener, and *C. forrestii* Schlechter. *Cynanchum rockii* is easily distinguished by the dark red, narrowly lobed corollas, which are glabrous except for the prominently woolly throat. It also grows at a higher altitude than members of the *C. vincetoxicum* complex.

**Cynanchum sinoracemosum** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: Kou ly Region of Pin tchouan, 1910, *J. Py* in *F. Ducloux 7653* (holotype, P).

Species nova *Cynancho corymboso*, *C. wallichii*, et *C. kintungensi* similis sed ab eis internodiis uniformiter puberulis, foliis angustioribus, lobis corollarum erectis glabris differt; etiam *C. duclouxii* similis sed ab eo floribus majoribus foliis angustioribus basibus non dilatatis differt.

Twining herbs. Stems puberulent all round when young, later along 1 or 2 sides only. Petioles 1.4–3.5 cm, slender, puberulent along adaxial groove; leaf blades lanceolate, 4.3–6(–8) × 1.5–2.5(–4.5) cm, adaxially sparsely pubescent, abaxially paler and more sparsely hairy, sometimes ± glabrous except for veins, base deeply cordate, basal lobes incurved and sometimes overlapping, apex long acute to

slightly acuminate; basal veins 5–7, lateral veins 3 or 4 pairs; minute stipule-like axillary leaves present. Inflorescences raceme-like, 2–4 cm, cymules 2-flowered, in regular spiral; peduncles 0.4–2.5 cm, puberulent. Pedicels 3–7 mm. Sepals ca. 1.3 × 0.7 mm, puberulent. Corollas white, erect, glabrous; lobes oblong-lanceolate, 3.3–4.5 × 1.3–1.5 mm. Coronas white, deeply cup-shaped, 2–3 mm high, concealing gynostegium, plicate, marginal lobes 5, ± bluntly triangular, to 0.4 mm, alternating with well-defined, ± appendage-like plicae. Anther appendages lanceolate, erect, white. Fruits not seen.

*Distribution.* China, Sichuan and Yunnan Provinces. Growing in hedges, at least at 1900 m.

*Cynanchum sinoracemosum* resembles *C. duclouxii* in having erect glabrous corollas and reduced corona appendages. *Cynanchum duclouxii* has distinctly smaller flowers with corona appendages reduced to paired gibbosities, whereas *C. sinoracemosum* has prominent longitudinal plicae and broader leaves often with enlarged basal lobes. Other species with similar coronas and inflorescences (e.g., *C. callialatum*, *C. corymbosum* Wight, *C. kintungense*, and *C. wallichii*) differ by their spreading to reflexed, mostly hairy, corollas and broader leaves. In all these closely related species the internodes have the hairs restricted to one or two narrow lines, but in *C. sinoracemosum* the internodes are uniformly hairy when young and do not develop the well-defined lines of hairs when glabrescent.

*Paratypes.* CHINA. **Sichuan:** Kouy Tchéou, June 1914, *J. Esquirol 5037* (P); Kouy Tchéou, near Ganpin, 29 Aug. 1897, *E. Bodinier & L. Martin 1958* (P). **Yunnan:** Yo lin chan, near Tong miy tcheou, 1911, *F. Ducloux* (P); near Ou se tchong, 1 Aug. 1904, *J. Tén* in *F. Ducloux 2904* (P); Yunnan Fu, 1900 m, 30 July 1916, *Schoch 255* (US).

**Cynanchum triangulare** M. G. Gilbert, W. D. Stevens & P. T. Li, nom. nov. Replaced name: *Cynanchum deltoideum* J. D. Hooker, Fl. Brit. India 4: 24. 1883, not *Cynanchum deltoideum* Hance, Ann. Sci. Nat., sér. 5. 5: 228. 1866. *Vincetoxicum deltoideum* ["deltodeum"] O. Kuntze, Rev. Gen. 2: 424. 1891. TYPE: India. Khasia Mts.: Kalapanee and Moflong, 5000–6000 ft., *Hooker & Thomson s.n.* (holotype, K; isotype, P).

*Cynanchum triangulare* has usually been dismissed (e.g., Tsiang & Li, 1977) as a synonym of *C. otophyllum* C. K. Schneider, but it differs from that by the much better developed corona tube and appears to be a good species restricted to northwestern India. This leaves *C. otophyllum* as a Chinese endemic.

**Heterostemma** Wight & Arnott.

*Heterostemma* has about 30 species distributed from India east through the tropics to northern Australia and Samoa. It is represented in China by nine species, of which four are endemic.

**Heterostemma menghaiense** (H. Zhu & H. Wang) M. G. Gilbert & P. T. Li, comb. et stat. nov. Basionym: *Heterostemma villosum* Costantin var. *menghaiense* H. Zhu & H. Wang, Acta Bot. Yunnan. 16: 27, fig. 2. 1994. TYPE: China. Yunnan: Xishuangbanna, Menghai, Mengsong, 1000 m, 14 May 1989, *Zhu H. & Wang H. 2443* (holotype, HITBC not seen).

*Heterostemma menghaiense* was first collected in 1938 by T. T. Yü (*Yü 16307*), and it is strange that it remained undescribed for so many years. It has possibly been confused with the Indochinese *H. villosum* Costantin, which has a much less distinctive indumentum. The uniformly densely long pilose indumentum is not matched by any other member of *Heterostemma*. Several species have lines of similar long hairs along the internodes, but the hairs on the leaves and flowers of these other species are always much finer and sparser than in *H. menghaiense* and are often appressed. The large flowers of *H. menghaiense* are also distinctive, matched best by those of *H. grandiflorum* Costantin.

*Second collection.* CHINA. **Yunnan:** Shunning, *T. T. Yü 16307* (A, E).

**Hoya** R. Brown.

*Hoya* is a genus of perhaps 100 species distributed primarily in southeastern Asia into Oceania. Seventeen of the 32 Chinese species are endemic.

**Hoya chinghungensis** (Tsiang & P. T. Li) M. G. Gilbert, P. T. Li & W. D. Stevens, comb. nov. Basionym: *Dischidia chinghungensis* Tsiang & P. T. Li, Acta Phytotax. Sin. 12: 130. 1974. TYPE: China. Yunnan: Che-li Hsien, Mengsoong, Dah-Meng-Lung, 1900 m, Sep. 1936, *C. W. Wang 78311* (holotype, IBSC; isotype, A).

The collections cited in the protologue of *Dischidia chinghungensis* are all in fruit, and flowers were not known to the original authors. Flowering collections are now available, and it is obvious that this is a species of *Hoya* closely allied to *H. lan-*

*ceolata* D. Don. Material of *H. chinghungensis* collected in Thailand (at Tee-Lao-Su waterfall, Mae Sod District, Tak Province, near the border with Myanmar), which was not seen by us, along with a good color photo on the cover, were discussed by Thorut (1993) as "*Hoya bella* subsp. nov." However, Thorut failed to make the connection with *D. chinghungensis*, even though he cited all the Chinese collections in the protologue of that species. There may well be a case for treating this and *H. bella* W. J. Hooker as subspecies of *H. lanceolata*, but this should only be done after a detailed study of the complex as a whole, which is otherwise entirely extra-Chinese.

*Material seen.* CHINA. **Yunnan:** Jinghong Xian, 1700 m, 5 June 1992, *Tsi Zhanhuo 92-362* (MO). MYANMAR. Northern Triangle, *Kingdon-Ward 21152* (E).

**Hoya commutata** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Guangxi: Shap Man Taai Shan, near Iu Shan village, SE of Shang-sze, near border with Guangdong, *W. T. Tsang 22375* (holotype, P, mixed with *H. fusca*).

Species nova a congeneris ramis floriferis dense pubescentibus foliis caducis, floribus purpureis, lobulis coronae acutis gracilibus sinus corollae excedentibus distinguenda.

Habit not known, possibly a hanging epiphyte. Stems pubescent. Leaves not known. Inflorescences pubescent, ca. 30-flowered; peduncles ca. 2 cm. Pedicels to 4 cm, slender, flexuous in dried specimens. Sepals triangular, ca. 2.5 × 0.9–1.3 mm, densely pubescent. Corollas rotate with revolute margins, "purple," ca. 1.5 cm diam., densely papillate-pubescent, limb ca. 0.8 cm wide. Corona lobes acute, stellately spreading, extending beyond sinus between corolla lobes; inner margins acute, ± meeting in center. Fruits not seen.

The only piece of *Hoya commutata* seen from China is a bare twig with a single inflorescence included with a collection of *H. fusca*. Other sheets of *Tsang 22375* have only young fruiting material of *H. fusca*. The two taxa can easily be separated by the fact that *H. commutata* is more or less uniformly pubescent, while *H. fusca* is glabrous.

The paratype is very similar to the holotype, again a bare stem with leaves from another plant, this time belonging to *Alstonia* (Apocynaceae). It differs from the holotype only by the sparser indumentum. The inflorescence and the long corona lobes, which extend beyond the sinuses between corolla lobes, are very similar indeed, though there is no note on the color. It would seem that *Hoya commutata* flowers on rather specialized hanging branches with caducous leaves, most unusual in a genus normally noted for its long-lived leaves.

*Paratype.* MYANMAR. Northern Triangle, *Kingdon-Ward 21276* (BM).

**Hoya mekongensis** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Xizang/Yunnan: Tsékou (Haut Mékong), 10 Oct. 1895, *Biet* in *Soulié 1598* (holotype, P; isotypes, P 2 sheets).

Species nova *Hoyae lii* Burton similis sed ab ea ramulis petiolisque non setosis inflorescentiis lateralibus differt.

Lianas climbing by adventitious roots. Stems minutely puberulent, glabrescent. Petioles 1.2–1.6 cm, minutely puberulent; leaf blades oblong-oblanceolate, 10–13 × 4–5 cm, minutely hairy, base rounded, apex acuminate to caudate-acuminate; lateral veins ca. 7, poorly defined. Pseudumbels extra-axillary, apparently flat topped, at least 8-flowered; peduncles (0.3–)1–2.5 cm, pubescent. Pedicels 2–2.7 cm, sparsely hairy on 1 side. Sepals ovate, ca. 1.5 × 1.5 mm, sparsely hairy. Corollas white, sweet scented, 1.5–1.7 cm diam., reflexed, lobes ca. 6 × 5 mm, minutely papillate with short-ciliate margins. Corona lobes ± ovoid, erect, ca. 2 times as high as gynostegium, dorsal grooves very narrow, inner tooth incumbent on gynostegium, just meeting in center. Anther margins short; appendages inconspicuous. Fruits not seen.

*Hoya mekongensis* appears to be most closely related to *H. lii* Burton, which has a similar reflexed corolla and erect, rounded corona lobes. It differs by having minutely puberulent stems and petioles and extra-axillary inflorescences. In contrast, *H. lii* has setose stems and petioles and terminal inflorescences.

**Jasminanthes** Blume.

We believe that the genus *Stephanotis* is best treated as a Malagasy endemic. Therefore, the following new combinations are needed for the *Flora of China*.

**Jasminanthes chunii** (Tsiang) W. D. Stevens & P. T. Li, comb. nov. Basionym: *Stephanotis chunii* Tsiang, Sunyatsenia 3: 165. 1936. TYPE: China. Guangdong: Tung-Wu Shan, 6 May 1928, *W. T. Chun 6417* (holotype, IBSC, originally in SYS).

**Jasminanthes mucronata** (Blanco) W. D. Stevens & P. T. Li, comb. nov. Basionym: *Apocynum mucronatum* Blanco, Fl. Filip. 852. 1837. TYPE: from seed sent from China (holotype, not preserved; see Merrill, 1918).

**Jasminanthes pilosa** (Kerr) W. D. Stevens & P. T. Li, comb. nov. Basionym: *Stephanotis pilosa* Kerr, Bull. Misc. Inform. 1938: 453. 1938. TYPE: Thailand. Loi, Dan Sai, Kao Keo Kang, 1300 m, *Kerr 5769* (holotype, K).

**Jasminanthes saxatilis** (Tsiang & P. T. Li) W. D. Stevens & P. T. Li, comb. nov. Basionym: *Stephanotis saxatilis* Tsiang & P. T. Li, Acta Phytotax. Sin. 12: 118. 1974. TYPE: China. Yunnan: Foo-Ning, 1100 m, 3 May 1940, *C. W. Wang 89139* (holotype, KUN).

**Lygisma** J. D. Hooker.

A genus of 3(–6) species known from Malaysia, Myanmar, Thailand, Vietnam, and China. One species in China.

**Lygisma inflexum** (Costantin) Kerr, Bull. Misc. Inform. Kew 1939: 457. 1939. Basionym: *Pilostigma inflexum* Costantin in Lecomte, Fl. Indo-Chine 4: 73. 1912. TYPE: Vietnam. Cochinchine, *Thorel s.n.* (holotype, P).

*Tylophora hainanensis* Tsiang & P. T. Li, Acta Phytotax. Sin. 10: 35. 1965. Syn. nov. TYPE: China. Hainan: Po-Ting, 120 m, 1 Oct. 1957, *H. D. Zhang 948* (holotype, HC-HSNU).

*Lygisma* is easily recognized by the small flowers with very characteristic inflexed corolla lobes. The correct generic position of the Chinese material had been questioned since it was first collected. It was placed in *Tylophora*, but with reservation. The type of *T. hainanensis* is a very good match with the type of *Lygisma inflexum*.

**Marsdenia** R. Brown.

*Marsdenia* includes about 100 species distributed in America, Asia, and tropical Africa. Of the 25 native species in China, 14 are endemic.

**Marsdenia brachyloba** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: Feng Chen Lin Mountain, *A. Henry 11196* (holotype, K).

Species nova a speciebus aliis inflorescentiis umbelliformibus, corolla purpurea, lobulis coronarum brevibus lateraliter compressis basibus profunde sulcatis distinguenda.

Lianas, glabrous except for sepal and corolla margins. Nodes with distinct interpetiolar line. Petioles 2.5–4.5 cm; leaf blades elliptic, 10–14.5 × 5–7.5 cm, abaxially very pale, adaxially dark with paler zone along midrib, base cuneate, apex acuminate; lateral veins 5 or 6 pairs, raised on both sides. Inflorescences umbel-like, up to 20-flowered; peduncles to 3 cm. Pedicels 1–1.7 cm. Sepals ± circular, ca. 1.5 × 1.5 mm, margin ciliolate. Corollas bell-shaped with spreading lobes, purple; tube ca. 2 mm, broader than long; lobes ca. 4 × 2 mm, apex rounded. Corona lobes ca. as high as anthers, laterally compressed with almost hooked tip, basal half deeply grooved. Anther appendages oblong, rather fleshy toward base, half as high as stigma head. Stigma head ovoid with acuminate, divided beak, exserted from corolla tube. Follicles solitary, lanceolate in outline, ca. 16 × 4 cm, base narrowed into a stalk 1 cm long. Seeds ovate, ca. 17 × 7 mm; coma off-white, to 3 cm.

Because of its somewhat reduced corona lobes, material of *Marsdenia brachyloba* has usually been filed under *Gongronema*. Each corona lobe is closely appressed to the anther in the form of an inverted "V" with the apex laterally compressed and somewhat recurved and the lower part deeply grooved, with the two legs of the "V" slightly spreading and almost winglike. This contrasts very strongly with the short, spreading, dorsiventrally compressed scales inserted at the bases of the anthers that characterize *Gongronema*. The conspicuously exserted stigma head of *M. brachyloba* is also similar to that of many other species of *Marsdenia* in the narrow sense.

*Paratype.* CHINA. **Yunnan:** Feng Chen Lin Mountain, *A. Henry 11073* (K).

**Marsdenia tenii** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: Siu tchoang, *Simeon Tén 395* (holotype, E).

Species nova *Marsdeniae hainanensi* Tsiang similis sed ab ea lamina foliari basi rotundata vel truncata, inflorescentiis longis simplicibus cymulos umbelliformes gerentibus differt.

Lianas, yellow-brown tomentose except for flowers. Petioles to 4 cm; leaf blades oblong-ovate, to 12.5 × 7.5 cm, sparsely hairy, base rounded to truncate, apex acute; lateral veins ca. 5 pairs. Inflorescences with several umbel-like cymules along an unbranched rachis; peduncles to 3 cm; rachis to at least 2 cm. Pedicels ca. 5 mm. Sepals elliptic, ca. 3 × 2 cm. Corollas white, rotate, ca. 6 mm, glabrous except for lobes and retrorsely pilose throat; lobes ca. 3.5 × 2.5 mm, densely appressed-tomentose in center. Corona lobes to base of anthers, almost flat. Stigma head bifid-conical, equaling anther appendages. Fruits not seen.

*Marsdenia tenii* is similar to *M. hainanensis*, *M. tomentosa* Morren & Decaisne, and *M. sinensis* Hemsley, with which it shares ovate tomentose leaves. It is easily separated from these by the inflorescence, which has a long, unbranched rachis. The other species have much-branched inflorescences that are often wider than long.

**Marsdenia tinctoria** R. Brown, Mem. Wern. Soc. 1: 28. 1810. TYPE: Indonesia. Sumatra: "Taram akkar Mars. Sumat. 78" (holotype, BM).

*Marsdenia globifera* Tsiang, Sunyatsenia 3: 199. 1936. Syn. nov. TYPE: China. Kwangtung: Yung Yuen, *S. K. Lau 24527* (isotype, P).

*Marsdenia tinctoria* var. *brevis* Costantin in Lecomte, Fl. Indo-Chine 4: 94. 1912. Syn. nov. SYNTYPES: Laos, Phon-thane, *Spire s.n.* (P); Pon-pissay, *Thorel s.n.* (P).

At first glance, the flowers of *Marsdenia globifera* are very distinct, and it is difficult to compare them with those of any other species. However, the stems and leaves are so similar to those of the common and widespread *M. tinctoria* that the two plants have to be closely related. A closer examination revealed that the flowers of *M. globifera* are diseased, and their lower part is an undifferentiated solid tissue. This is hinted at by the drawing of a longitudinal section of a flower in the protologue. Therefore, we have no hesitation in including this diseased material in *M. tinctoria*.

**Marsdenia yuei** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: Mienning, Taheching, 2300 m, *T. T. Yü 17801* (holotype, E).

Species nova *Marsdeniae koi* Tsiang similis, sed ab ea pedunculis brevioribus, corollis glabris parvilobis, lobulis coronae tubo corollae longioribus differt.

Lianas, glabrous except for flowers. Stems stout. Petioles 4 cm; leaf blades ovate, ca. 9.5 × 5.8 cm, base shallowly cordate, apex bluntly cuspidate to shortly acuminate, lateral veins 4 or 5 pairs, flattened. Inflorescences umbel-like, up to 9-flowered; peduncles ca. 15 mm. Pedicels to 9 mm. Sepals rounded, ca. 3 × 2.5 mm, finely appressed puberulent. Corollas white, ± campanulate, glabrous except for sparsely ciliate margins; tube ca. 4.5–5 × 4 mm; lobes oblong-obovate, ca. 5.5 × 2.5–3.2 mm, apex rounded. Gynostegium ca. 6 mm high. Corona lobes narrowly triangular, as long as anther appendages, apex rounded, exserted from corolla tube. Anther appendages ovate, membranous margin relatively narrow. Stigma head hemispherical, conspicuously exserted from anther appendages and corolla tube. Fruits not seen.

We take pleasure in dedicating *Marsdenia yuei* to the collector, one of the most highly regarded of all Chinese plant taxonomists. The type collection was cited as *M. medogensis* P. T. Li in the protologue of that species, which has much larger flowers with corolla lobes ca. 9 × 9 mm, discoid stigma head only slightly exserted from the anther appendages, and oblong leaf blades more than four times as long as broad with rounded base and acute apex. Vegetatively *M. yuei* seems more closely related to *M. koi* Merrill than to *M. medogensis*. *Marsdenia koi* has much longer pedicels, larger flowers, and corona lobes shorter than the anthers and corolla tube.

**Merrillanthus** Chun & Tsiang.

The original account of this monotypic genus described the pollinia as pendulous, which would make it a member of the Asclepiadeae. The general morphology, especially the form of the corona lobes, suggested that this might not be correct, but most material available had flowers too poorly preserved to check the pollinia. An isoparatype sheet, *Lau 3550* (P), has flowers well enough preserved to examine the corona in more detail. This proved to be extremely *Tylophora*-like in all respects, including the horizontal pollinia. *Tylophora augustiniana* (Hemsley) Craib is particularly similar, differing only by the much smaller flowers. *Merrillanthus* can be easily separated from known species of *Tylophora* by the large fruit with a thick fibrous mesocarp, in contrast to the very thin, often almost papery follicle walls of all species of *Tylophora* familiar to us. Thus *Merrillanthus* is kept, at least until *Tylophora* as a whole is revised. However, the fruits of *T. augustiniana* have not been described, and *Marsdenia*, even in the narrow sense adopted for the *Flora of China*, shows a comparable range of fruit types. A collection from Cambodia, *M. A. Martin 310* (P), is almost certainly *M. hainanensis*, which would mean that *Merrillanthus* is no longer endemic to China.

**Sichuania alterniloba** M. G. Gilbert & P. T. Li, gen. et sp. nov. TYPE: China. Sichuan: S Wushan, *A. Henry 7262* (holotype, E).

Genus et species nova *Holostemmate* R. Brown similis sed ab eo inflorescencentiis racemiformibus, floribus minoribus, lobulis coronae liberis et antheris alternantibus, antheris pallidis lucentibus marginibus longis dorsaliter sulcatis appendicibus prominentibus scariis manifeste differt.

Robust twining herbs. Stems minutely puberulent along 1 side (sometimes along 2 at base of internode).

Petioles 2–3 cm; leaf blades ovate-triangular, 5–8 × 3.3–7 cm, abaxially pale, adaxially much darker and apparently glossy, base cordate, thick, glabrous throughout; lateral veins 4–6 pairs. Inflorescences raceme-like, with few-flowered cymes arranged in lax spiral along rachis; peduncles 1.5–5.5 cm, sometimes sharply reflexed; rachis up to 2 cm; bracteoles few, ca. 1 mm. Pedicels up to 1 cm, puberulent along 1 side. Sepals lanceolate, ca. 2.7 × 1.3 mm, apex acute, almost glabrous. Corollas very shallowly bowl-shaped, almost rotate, white, glabrous; lobes ovate, ca. 5.5 × 3.5 mm. Corona lobes separate, alternating with anthers, ovate to ± semicircular, short and inconspicuous. Gynostegium ca. 2.5 mm high; anthers ca. 2 mm, uniformly pale and glossy with long margins and dorsal groove; anther appendages ovate, scarious except for narrow midrib. Retinaculum ca. 0.5 mm; translator arms short and rigid; pollinia cylindrical-ovoid, slightly compressed, ca. 0.6 mm. Stigma head apiculate, concealed by anther appendages. Fruits not seen.

*Distribution.* Endemic to China, Sichuan Province (South Wushan and Tianquan Xian).

The generic position of *Sichuania alterniloba* is so questionable that it seems best to place it in a genus of its own. The original collection had been named as *Holostemma*, a view supported by the presence of an interpetiolar line, fairly large, hard-textured anthers more or less decurrent at the base to the corolla, pendent pollinia, and fairly thin-textured corona. However, the distinctive corona with separate, spreading, ovate scalelike lobes alternating with the anthers (i.e., opposite the corolla lobes) is quite different from the annular corona of *Holostemma* and from that of any other genus known to us. Other genera such as *Gongronema* have free, scalelike corona lobes inserted at the base of the gynostegium. In all taxa with similar scalelike lobes known to us, these are opposite the anthers. *Roulinia parviflora* Decaisne (*Cynanchum contrapetalum* E. Sundell; see Sundell, 1981) is described as having corona lobes opposite the corolla lobes, but these are erect and grooved. *Cynanchum contrapetalum* is apparently in all other ways typical of *Cynanchum* subg. *Mellichampia* and thus is unrelated to *Sichuania*. The anther form of *Sichuania* is also different from that of *Holostemma* in that the anther tips are more or less retuse with very sharply delineated scarious appendages, not acuminate with poorly differentiated inconspicuous appendages.

*Paratype.* CHINA. **Sichuan:** Tianquan Xian, 1000 m, 11 Sep. 1963, *West of Sichuan Expedition Group 3334* (HNWP).

**Tylophora** R. Brown.

*Tylophora* is in need of an overall revision. Most African material has never been named. The distinction from allied genera such as *Belostemma* Wallich ex Wight, *Merrillanthus*, and *Pentastelma* Tsiang & P. T. Li needs closer investigation. Some of the species from tropical Asia look very different from typical members of the genus and equally deserve investigation.

The separation between *Cynanchum* and *Tylophora* on floral morphology is sometimes difficult. It is often hard to interpret the orientation of the pollinia in the smaller-flowered asclepiads with only slightly elongated pollinia, especially in dried material. In most cases the characteristic erect corona lobes clearly inserted on the anthers of most species of *Tylophora* is diagnostic. However, there are some species, such as *T. glabra* Costantin, otherwise typical of the genus, in which the corona lobes are almost free from the anthers, spreading and laterally joined at the base to form a very *Cynanchum*-like structure. Several non-floral characters often enable the confident recognition of virtually all species of *Tylophora*, at least in mainland Asia. These include often elongated, zigzag, inflorescence rachises, widely spaced cymules frequently elongated with age, very narrow bracts, threadlike pedicels, and often paired, widely divaricate fruits. None of these characters is of itself diagnostic, but in combination they form a distinctive facies that leaves little doubt in the recognition of *Tylophora*.

**Tylophora costantiniana** (Tsiang) M. G. Gilbert, W. D. Stevens & P. T. Li, comb. nov. Basionym: *Cynanchum costantinianum* Tsiang, Sunyatsenia 4: 119. 1939, new name for *Cynanchum hirsutum* Costantin, in Lecomte, Fl. Gen. Indo-Chine 4: 66, fig. 10 (12–13). 1912, not *C. hirsutum* Vahl, Eclog. Amer. 2: 24. 1798, nor *Tylophora hirsuta* (Wallich) Wight, Contr. Bot. India 49. 1834. TYPE: Vietnam. Tonkin, Mekong, *Thorel s.n.* (holotype, P).

The type material of *Cynanchum hirsutum* Costantin is mostly in fruit. However, one stem has an inflorescence with buds developed sufficiently to confirm that this is a *Tylophora* closely related to *T. tsiangii*.

**Tylophora forrestii** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: hills NW of Tiugyueh(?) (25°30′N, 98°25′E), 2100 m, May 1931, *Forrest 29601* (holotype, E).

Species *Tylophorae ovatae* (Lindley) Hooker ex Steudel similis sed ab ea internodiis glabrescentibus, foliis membranaceis, inflorescentiis longioribus cymulas umbelliformes gerentibus, floribus majoribus differt; a *T. brownii* foliis membranaceis basi cuneatis vel rotundatis differt.

Lianas. Stems uniformly pubescent when young but glabrescent and soon glabrous or pubescent along 1 side only. Petioles to 2 cm; leaf blades ovate-elliptic, to 9.4 × 4.2 cm, membranous, base broadly cuneate to ± rounded, apex acuminate; lateral veins 4 or 5 pairs, prominently pilose when young, glabrescent. Cymes to 8 cm; peduncles to 4.5 cm, pubescent, cymules ± umbel-like, ca. 6-flowered; bracts linear, ca. 1.5 mm. Pedicels to 15 mm. Sepals linear-lanceolate, ca. 3 × 0.4 mm, apex acute, margins prominently ciliate. Corollas yellow-green, tube ca. 0.7 mm, lobes ca. 6 × 1.6 m wide, glabrous. Corona lobes narrowly ovoid, appressed to gynostegium and reaching base of anthers, ± acute. Gynostegium ca. 2 mm high; anther appendages ovate, erect. Corpusculum longer than ellipsoid pollinia. Fruits not seen.

The indumentum suggests an affinity to *Tylophora ovata*, but *T. forrestii* is a more vigorous plant with softer leaves, larger flowers, more strictly umbel-like cymules, and readily glabrescent stems.

**Tylophora glabra** Costantin in Lecomte, Fl. Indo-Chine 4: 109. 1912. TYPES: Vietnam. Tonkin vers Ninh-Binh, *Bon s.n.* (syntype, P); vers Ouonbi, au nord de Guang-yen, *Balansa 609* (syntypes, P, K); Sept Pagodes, *Mouret s.n.* (syntype, P).

*Tylophora longipedicellata* Tsiang & P. T. Li, Act. Phytotax. Sin. 12: 136. 1974. Syn. nov. TYPE: China. Hainan: Lung-Kiang, 15 Sep. 1933, *C. H. Tsoong 545* (holotype, IBSC).

*Tylophora renchangii* Tsiang, Sunyatsenia 3: 232. 1936. Syn. nov. TYPE: China. Guangxi ("Kwangsi"): Tien-chen, N of Sup-man-ta Shan, 900 m, 13 Oct. 1928, *R. C. Ching 7821* (holotype, IBSC; isotype, A).

Tsiang (1936) first drew attention to the unusual corona of this species in his protologue for *Tylophora renchangii*. The corona lobes are almost *Heterostemma*-like and distinct from any other *Tylophora* seen from mainland Asia. Typical *Tylophora* corona lobes are closely appressed to the stamens, dorsally gibbous, and have an acuminate tip. In *T. glabra* the corona lobes are more or less circular, inserted at the base of the anthers, and spread at an angle of about 45° to them, while the acuminate tip is often strongly reflexed. Superficially these are so different that it is difficult to accept this species in *Tylophora*, but all other features of *T. glabra* are typical of that genus.

The status of *Tylophora longipedicellata* deserves more investigation. Most material from Hainan has the broad spreading corona lobes with a blunt inflexed tip characteristic of *T. glabra*. Other collections have short erect corona lobes with an erect acuminate tip, as illustrated in the protologue of *T. longipedicellata*. In other features, the two species are nearly identical. *Henry 8275* (K) has corona lobes somewhat intermediate between those of the two species. Therefore, we tentatively reduce *T. longipedicellata* to synonymy of *T. glabra*.

**Tylophora oligophylla** (Tsiang) M. G. Gilbert, W. D. Stevens & P. T. Li, comb. nov. Basionym: *Absolmsia oligophylla* Tsiang, Sunyatsenia 6: 121. 1941. TYPE: China. Yunnan: Che-li Hsien, Aug. 1936, *C. W. Wang 75455* (holotype not seen; isotype, PE).

The generic placement of *Absolmsia oligophylla* is uncertain. It differs profoundly from the type and only other species of *Absolmsia*, *A. spartioides* (Bentham) Kuntze, which is a very specialized relative of *Hoya*, known only from rot holes in large trees in Borneo. *Absolmsia spartioides* has fleshy leaves when young but then depends on persistent, long, stiff, photosynthetic peduncles, which seem to take over the function of leaves. A sheet labeled in Tsiang's handwriting as the holotype of *A. oligophylla*, deposited in the herbarium of the Fan Memorial Institute of Biology and now housed in the Institute of Systematic Botany, Beijing (PE), consists of the lower part of a single stem and completely lacks any trace of inflorescences and flowers. A photograph of a different sheet showing the upper parts was reproduced in the protologue. A search for an isotype at the South China Institute of Botany was not successful. The material seen appears to come from a prostrate plant with no sign of the stem's twining and with soil adhering to the undersides of the leaves, very like *Tylophora rotundifolia* Hamilton ex Wight, which also has similar almost circular leaves. The illustration of the flowers accompanying the protologue, particularly the small gynostegium, is also suggestive of a *Tylophora*. The spreading corona lobes would be unusual for *Tylophora*, but *T. glabra* Costantin has even larger spreading lobes that are at least superficially similar. The description of pollinia as pendulous, if correct, would rule out a placement in *Tylophora*, but, as discussed above, *Merrillanthus* was described as having pendulous pollinia whereas examination of material cited in the protologue showed the pollinia

to be horizontal. The large, stiffly papery leaves and indumentum of short stiff hairs of *T. oligophylla* are distinctive, and it should be easy to make a positive match with new material, should this become available.

**Tylophora rockii** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Sichuan: Muti Konka, 3300 m, *Rock 23717* (holotype, E).

Species nova *Tylophorae yunnanensi* Schlechter similis sed ab ea inflorescentiis sessilibus, floribus majoribus, capite stigmatico elevato differt.

Erect herbs to 70 cm. Stems little branched, tending to twine at tips, uniformly puberulent. Petioles ca. 15 mm; leaf blades oblong-oblanceolate, to 9.5 × 4 cm, sparsely puberulent, uppermost and lowermost reduced, base cuneate to ± rounded, apex rounded-apiculate, margins ± undulate, veins 4 or 5 pairs. Inflorescences extra-axillary from upper nodes, to 8 cm, mostly ± sessile with long first internode, cymules shortly and densely raceme-like to umbel-like. Pedicels to 1(–2) cm. Sepals linear-triangular, ca. 3 mm. Corollas purplish, stiffly rotate, 8–10 mm diam.; lobes oblong, 5(–7) × 2.5–3 mm, apex rounded; interior densely puberulent. Corona lobes reaching base of anther appendage, ± acute. Gynostegium ca. 1.5 mm high; anther appendages broader than long. Stigma head broadly dome-shaped with light-colored center. Fruits not seen.

*Tylophora rockii* is most closely related to *T. yunnanensis*, which has distinctly smaller flowers, sepals ca. 1.5 mm long, and corolla lobes 3–4 × 1.5–2 mm. *Tylophora rockii* has mainly sessile inflorescences with long first internodes, whereas *T. yunnanensis* has peduncles to 6 cm long. *Tylophora rockii* has a broadly dome-shaped stigma head in contrast to the depressed stigma head of *T. yunnanensis*.

**Tylophora tsiangii** (P. T. Li) M. G. Gilbert, W. D. Stevens & P. T. Li, comb. nov. Basionym: *Cynanchum tsiangii* P. T. Li, Bull. Bot. Lab. North-E. Forest. Inst. 3(1): 103. 1983. TYPE: China. Guizhou: Xing-yi, 1300 m, 7 Oct. 1960, *Y. T. Chang et al. 6880* (holotype, SCBI).

The hispid indumentum, brownish coloring of the dried leaves, and inflorescence architecture (a long zigzag rachis with elongated raceme-like cymules and linear bracts) of *Tylophora tsiangii* are all very similar to those of *Tylophora ovata* (Lindley) Hooker ex Steudel. The short, elliptic corona lobes adnate to and clearly shorter than the anthers are typical for *Tylophora*. Though placed in different parts of the family, the distinction in floral morphology between these two genera can be very subtle. *Tylophora tsiangii* is clearly related to the Indochinese *T. costantiniana*, which is very similar in habit and was also misplaced within *Cynanchum*.

**Tylophora tuberculata** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Yunnan: Kouy-Tcheou, Echâng loing, 800 m, May 1913, *Esquirol 4377A* (holotype, P, mixed with *Cynanchum corymbosum* Wight).

Species nova *Tylophorae tenui* Blume similis sed ab ea et speciebus similibus caulium indumento ex trichomatibus erectis crassisque constante, foliis adaxaliter tuberculatis, lobulis coronae basaliter connatis, dorsaliter dilatatis umbonem subpatentem truncatum vel leviter emarginatum formantibus manifeste distinguenda.

Lianas. Stems slender, short pilose along 2 sides. Petioles 5–10 mm, adaxially hairy, glabrescent; leaf blades lanceolate, 2.5–4 × 1.1–1.2 cm, thick papery, base rounded-cordate, apex acute, glabrous, adaxially with prominent scattered tubercles. Inflorescences to 4 cm, much branched; peduncles to 6 mm, internodes to 14 mm. Pedicels 4–6 mm, glabrous. Sepals lanceolate, ca. 0.7 mm, tip recurved, acute, glabrous. Corollas rotate to shallowly bowl-shaped, ca. 5 mm diam., greenish white, glabrous outside, densely short pilose inside; lobes ovate, ca. 2 × 1.5 mm. Corona lobes joined at base, reaching base of anther, with very prominent spreading, truncate or slightly emarginate, dorsal projection. Anther appendages short, rounded; pollinia ellipsoid, almost vertical. Stigma head rounded. Old follicles linear lanceolate in outline, ca. 6.5 × 0.5 cm.

*Tylophora tuberculata* resembles *T. tenuis* Blume in having small lanceolate leaves and delicate much-branched inflorescences. It differs from that and all similar species of *Tylophora* by the thick stiffly erect hairs forming two lines down the internodes of young stems and along the margins of the petioles, the well-defined small tubercles scattered adaxially on leaf blades, the inflorescence with the peduncle clearly shorter than the internodes of the branched rachis, and the distinctive corona lobes, which are enlarged dorsally into a more or less spreading, fleshy, truncate to slightly emarginate projection and joined laterally at the base by a thin flange. The corona can be interpreted as forming a link between the corona lobes of typical species of *Tylophora*, in which the lobes are only slightly swollen dorsally, and the corona lobes of *T. glabra*, in which the dorsal swelling seems to be grossly expanded into a flat disc. The only sheet seen also has a fruit of *Cynanchum corymbosum* Wight mounted on it.

**Tylophora uncinata** M. G. Gilbert & P. T. Li, sp. nov. TYPE: China. Hainan: Po-ting, *How 73159* (holotype, IBSC; isotypes, A, IBSC).

Species nova *Tylophorae ovatae* (Lindley) Hooker ex Steudel affinis sed ab ea lamina foliari adaxialiter glabra abaxialiter trichomatibus apice uncinatis basi papillosis manifeste differt.

Lianas. Stems glabrescent. Petioles ca. 1.5 cm; leaf blades ovate, 3.5–9 × 1.3–5.5 cm, stiffly papery, adaxially glabrous, abaxially uniformly pubescent, hairs with papillate bases and strongly hooked tips, base cordate, sinus usually deep and narrow, apex ± acute, apiculate. Cyme extra-axillary; peduncles to 2 cm, rachis zigzag, sometimes ± absent, cymules densely raceme-like; bracts linear-lanceolate, to 1.5 mm. Pedicels 6–8 mm. Sepals ca. 1.7 × 0.5–0.7 mm, oblong-lanceolate, apex acute, with few to many hooked hairs. Corolla pale green at apex, dull green at base, 3.5–5 mm; tube ca. 0.5 mm; lobes ovate to ovate-oblong, 2.5–3.5 × 1.2–1.3 mm. Corona lobes ovate, ca. 0.5 × 0.2 mm, pouched, apex obtuse, covering base of anthers. Anther appendage rounded; pollinia globose, horizontal. Stigma head ± flat, 5-angled, depressed in center. Follicles linear-lanceolate in outline, ca. 5 × 0.6 cm, apex acuminate. Flowering August–September.

*Tylophora uncinata* had been named mostly as *T. ovata* (Lindley) Hooker ex Steudel var. *brownii* (Hayata) Tsiang & P. T. Li, but closer examination has shown that it differs from all species of *Tylophora* known to us by the very distinctive hooked hairs on the underside of the leaves. *Tylophora uncinata* differs further from otherwise similar species such as *T. ovata* by the more papery, adaxially glabrous leaves.

*Paratypes.* CHINA. **Guangdong:** Gao-zhou, 4 Apr. 1929, *Y. Tsiang 2088B* (IBSC). **Guangxi:** Shang-si, 2 Aug. 1951, *W. C. Ko 901* (CANT); without locality, Nov. 1889, *A. Henry 8105* (K, P).

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Literature Cited

Merrill, E. D. 1918. Species Blancoanae. Publ. Dept. Agric. Nat. Resour. Manila 12: 1–423.

Sundell, E. 1981. The New World species of *Cynanchum*, subgen. *Mellichampia* (Asclepiadaceae). Evol. Monogr. 5: 1–63.

Thorut, C. 1993. A very special *Hoya*. The Hoyan 15: 29–30.

Tsiang, Y. 1936. Notes on the Asiatic Apocynales III. Sunyatsenia 3: 121–239.

———. 1939. An enumeration of the Asclepiadaceae plants collected by Tsai and Wang from Yunnan in 1933–1936. Sunyatsenia 4: 95–130.

——— & P.-T. Li. 1977. Asclepiadaceae. *In:* Fl. Reipubl. Popularis Sin. 63: 249–575.

# Nomenclatural Notes on the Boraginaceae of China

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ABSTRACT. Three new combinations, *Tournefortia sibirica* L. var. *angustior* (A. DC.) G. L. Chu & M. G. Gilbert, *Lappula ferganensis* (Popov) Kamelin & G. L. Chu, and *L. lasiocarpa* (W. T. Wang) Kamelin & G. L. Chu, plus a new name, *Trigonotis harrysmithii* R. R. Mill, are validated.

Two precursory papers on the Boraginaceae for the *Flora of China* have already been published (Kamelin, 1993; Riedl, 1994). The following additional nomenclatural adjustments are herein proposed to make the names available for the forthcoming Volume 16 of the *Flora of China*.

**Tournefortia sibirica** L. var. **angustior** (A. DC.) G. L. Chu & M. G. Gilbert, comb. nov. Basionym: *Tournefortia arguzia* Roemer & Schultes β *angustior* A. DC., Prodr. 9: 514. 1845. SYNTYPES: China. Nei Mongol ("Chinese Mongolia"), *Turczaninow s.n.*, *Bunge s.n.*; Kazakhstan. E shore of Caspian Sea, *Karelin s.n.* and *Hohenacker s.n.*; Russia. Astrakan, *Bieberstein s.n.*; Turkey ("Asia Minor"), *Aucher-Éloy s.n.*; Ukraine. S Podoliâ, *Turczaninow s.n.* (All syntypes in G, not seen.)

The new combination is needed because the variety does not have a valid combination in *Tournefortia sibirica*. A lectotype should be designated from de Candolle's original material at G. Such material has not been examined by us.

**Trigonotis harrysmithii** R. R. Mill, nom. nov. Replaced name: *Trigonotis smithii* W. T. Wang, Bull. Bot. Res., Harbin 13(1): 3. 1993, not *Trigonotis smithii* Banerjee, Bull. Bot. Surv. India 8: 325. 1966 (1967). TYPE: China. Sichuan: Sungpan, 3200 m, 14 July 1922, *Harry Smith 2775* (holotype, UPS; isotype, PE).

The earlier name *Trigonotis smithii* Banerjee, which applies to a species from Bhutan and the east Himalaya so far not recorded from China, was named after William Wright Smith, the collector of the type specimen and a former Regius Keeper of the Royal Botanic Garden, Edinburgh. The later homonym was dedicated to the Swedish botanist Harry Smith, an expert on the Gentianaceae who collected in China.

There has been a reappraisal of the characters dividing *Lepechiniella* from *Lappula*. *Lappula* is readily distinguished from *Lepechiniella* in having styles exserted from the nutlets instead of concealed by them. No Chinese material belongs to *Lepechiniella* as thus defined, which makes necessary the following generic transfers.

**Lappula ferganensis** (Popov) Kamelin & G. L. Chu, comb. nov. Basionym: *Lepechiniella ferganensis* Popov, Fl. USSR 19: 715. 1953. TYPE: [Tajikistan]. Alai Valley, Mount Kultzcha, 26 June 1931, *Lipschitz 248* (holotype, MW).

*Lappula platyptera* C. J. Wang, Bull. Bot. Res., Harbin 1(4): 91. 1981. Syn. nov. TYPE: China. Xinjiang: Wuqia Xian, 3300 m, 4 Aug. 1978, *Xinjiang Expediton 1911* (holotype, WUK).

**Lappula lasiocarpa** (W. T. Wang) Kamelin & G. L. Chu, comb. nov. Basionym: *Lepechiniella lasiocarpa* W. T. Wang, Bull. Bot. Res., Harbin 4(2): 7. 1984. TYPE: China. Xinjiang: Fuhai, 21 May 1959, *Y. F. Wang s.n.* (holotype, PE).

*Lepechiniella balchaschensis* M. Popov, Spisok. Rast. Gerb. Fl. SSSR 12: 50. 1953. Syn. nov. *Lappula betpakdalensis* Nabiev, Opred. Rast. Sred. Azü 8: 138. 1986, not *Lappula balchaschensis* M. Popov ex N. Pavl., Zhurn. Bot. U.R.S.S. 30(4): 190. 1945. TYPE: Kazakhstan. Lake Balchasch, southern shore at Bertys Bay, 15 June 1934, *M. Popov s.n.* (holotype, LE).

*Lepechiniella balchaschensis* is the oldest name for this species, but the epithet is not available in *Lappula* because Popov had already described *Lappula balchaschensis* based on a different type. The transfer to *Lappula* was made in 1986 by Nabiev, who introduced the replacement epithet *betpakdalensis*. However, *Lepechiniella lasiocarpa* W. T. Wang is the older name that should be used in *Lappula*.

Literature Cited

Kamelin, R. 1993. Nomenclatural adjustments in Chinese Boraginaceae. Novon 3: 263.

Riedl, H. 1994. A new species and new combinations of Boraginaceae from China. Novon 4: 46–47.

# *Onosma apiculatum* (Boraginaceae), a New Species from China

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ABSTRACT. *Onosma apiculatum* from Xinjiang, China, is described. Its relationship to the three species of series *Tianschanica* is discussed, and its distinguishing characters from these are given.

**Onosma apiculatum** H. Riedl, sp. nov. TYPE: China. Xinjiang: Zhao Moa Hong Qi, 2nd woodcutting grounds, 2100 m, 9 June 1965, *Cheo Tai-yien et al. 650713* (holotype, SZ; isotype, SZ; photos, W).

Herba perennis, foliis rosulae linearibus vel linearisubspathulatis, basin versus petiolatim attenuatis, 4–13 cm longis, 4–8 mm latis; foliis caulinis inferioribus basalibus similibus basin versus paulo tantum attenuatis, superioribus prope basin latissimis manifeste brevioribus, omnibus viridibus, supra setis patentibus densis tuberculis albis vix elevatis e circulis 2 vel 3 cellularum compositis insidentibus et papillis nonnullis minutis, infra setis imprimis in nervo mediano densis, ceterum laxis pilisque brevibus numerosis densissimis vestitis, cymis singulis vel geminatis, calyce ca. 1.5 cm longo, laciniis linearibus, subobtusis, usque ad basin liberis, corolla 2–2.2 cm longa, compressa 8 mm fere lata, extra minutissime papillosa, intus glabra, antheris tota longitudine cohaerentibus apice sterili vix 1 mm longe exsertis; filamentis antheris paulo brevioribus, in parte tertia inferiore corollae insertis, stylo corollam 2.5–3 mm superante stigmate bilobo insignis.

Herbs perennial, with a single flowering stem and sterile rosette of leaves arising from either a stout vertical rhizome or from its ± horizontal branches. Stem lateral, ascending, 20–35 cm high, unbranched, straw-colored when dry, densely covered by a mixture of white patent bristles ca. 2 mm long and very short patent hairs. Leaves of the sterile rosette 4–13 cm long, 4–8 mm wide, linear-spatulate to linear oblanceolate, tapering into a petiole-like base, revolute at margin, acute to subobtuse at apex, green, densely covered adaxially with patent to subappressed white bristles arising from a white, nearly flat tubercle composed of 2 or 3 circles of roundish to radially elongated, strongly convex cells and numerous minute papillae, abaxially covered with similar bristles mainly along the midrib and only sparsely on other parts, with dense short hairs as those on stem; lower stem leaves similar to rosette leaves in size and shape but only a little narrowed toward base; uppermost leaves much shorter, 2.5–4 cm long, widest near base, acute, bristles and hairs as in rosette leaves. Cymes single or paired, involute, 4–6 cm long in flower; lower bracts similar to upper stem leaves, to 2 cm long, broad at base, decreasing in size upward. Lower pedicels to 5 mm long, upper ones to 2 mm. Calyx ca. 1.5 cm long in flower, divided to base into 5 linear, subobtuse lobes densely covered with fairly soft, appressed or subappressed bristles and short hairs, elongated soon after flowering. Corolla pale yellow, turning brown after flowering and when dry at least in apical part, club-shaped, 2–2.2 cm long, ca. 8 mm wide just below lobes, ca. 3 mm wide at base in the compressed state, very minutely papillate outside, glabrous inside and on nectary; lobes ca. 1.5 mm long, recurved, ca. 4.5 mm wide at base, abruptly tapering into an obtuse apex ca. 1.5 mm wide. Anthers coherent for their entire length, ca. 9.5 mm long, fertile part ca. 3.5 mm; sterile tips horizontally truncate at apex, exserted from corolla for less than 1 mm; filaments ca. 7 mm long, ca. 0.8 mm wide, tapering toward anther. Style surpassing corolla by 2.5–3 mm; stigma 2-lobed. Nutlets not seen.

*Onosma apiculatum* belongs to series *Tianschanica* Popov, the three other species of which are *O. gmelinii* Ledebour, *O. irritans* Popov ex Pavlov, and *O. baldshuanicum* Lipsky. From *O. gmelinii*, the new species is distinguished by its green instead of grayish leaves, bracts longer than calyx, club-shaped corolla, and slightly longer anthers; from *O. irritans* by its markedly wider leaves without a distinct petiole, presence of short hairs between the bristles, bracts longer than calyx, shorter calyx, and club-shaped corolla; and from *O. baldshuanicum* by its narrower leaves without a distinct petiole, much denser cover of bristles and short hairs, bracts longer than calyx, and shorter anthers. *Onosma apiculatum* also differs from these three species by its shorter corolla and by the shape of its corolla lobes, which are very broad at base and suddenly contracted into a narrow tip, hence the specific epithet *apiculatum*. The type collection was misidentified as *O. echioides* L., but this species is native to Europe and adjacent parts of Turkey and differs by several characters, the most notable of which are the shorter calyx scarcely half as long as corolla and the asterotrichous indumentum.

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# New Combinations in Neotropical Grammitidaceae (Pteridophyta)

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ABSTRACT. Continuing study on neotropical Grammitidaceae for various floras in press or in progress necessitates the following new combinations: *Ceradenia oidiophora*, *C. phalacron*, *Lellingeria ciliolepis*, *L. dissimulans*, *L. hombersleyi*, *Melpomene gracilis*, *M. zempoaltepetlensis*, *Terpsichore bipinnata*, *T. elastica*, and *T. flexuosa*.

Examination of additional types of several rare and geographically restricted species of Grammitidaceae, as well as further study of problematic groups, has resulted in the need for several new combinations. This work is a continuation of observations previously published on the genera *Ceradenia*, *Lellingeria*, *Melpomene*, and *Terpsichore* (Bishop, 1988; Smith et al., 1991; Smith & Moran, 1992; Smith, 1993).

**Ceradenia oidiophora** (Mickel & Beitel) A. R. Smith, comb. nov. Basionym: *Grammitis oidiophora* Mickel & Beitel, Mem. New York Bot. Gard. 46: 202. 1988. TYPE: Mexico. Oaxaca: Dto. Ixtlán, trail from San Pedro Nolasco N to the Llano Verde, *Mickel 3822* (holotype, NY; isotype, UC).

Known only from four collections from Oaxaca (Mickel & Beitel, 1988).

**Ceradenia phalacron** (Stolze) A. R. Smith, comb. nov. Basionym: *Grammitis phalacron* Stolze, Fieldiana, Bot. 32: 84. 1993. TYPE: Peru. Cuzco: Valley of Río Urubamba, *Bües A29* (holotype, US).

*Ceradenia phalacron* is known only from the type. It is somewhat aberrant in *Ceradenia* because of its relatively simple or only shallowly lobed blades, lack of laminar setae, and prominulous veins, but it fits more comfortably there than in any other described genus. With other ceradenias, it agrees in the absence of hydathodes, castaneous rhizome scales with setulose margins, lack of spongy parenchyma, the prominulous venation, the lack of laminar or circumsoral setae, and the glandular paraphyses within the sorus.

**Lellingeria ciliolepis** (C. Christensen) A. R. Smith, comb. nov. Basionym: *Polypodium ciliolepis* C. Christensen in Asplund, Ark. Bot. 20A: 21. 1926. *Ctenopteris ciliolepis* (C. Christensen) Copeland, Philipp. J. Sci. 84: 395. 1956 [1955]. *Grammitis ciliolepis* (C. Christensen) Lellinger, Amer. Fern J. 74: 58. 1984. TYPE: Bolivia. Sur Yungas, El Chaco valley, *Asplund 1501* (isotype, US).

**Lellingeria dissimulans** (Maxon) A. R. Smith, comb. nov. Basionym: *Polypodium dissimulans* Maxon, Contr. U.S. Natl. Herb. 10: 502. 1908. *Ctenopteris dissimulans* (Maxon) Copeland, Philipp. J. Sci. 84: 415. 1956 [1955]. *Grammitis dissimulans* (Maxon) F. Seymour, Phytologia 31: 179. 1975. *Melpomene dissimulans* (Maxon) A. R. Smith & R. C. Moran, Novon 2: 429. 1992. TYPE: Guatemala. Alta Verapaz: near Cobán, *von Türckheim* (ed. Donnell Smith 884) (holotype, US).

On the basis of descriptions, this rare and poorly known species was mistakenly transferred to *Melpomene* (Smith & Moran, 1992), but examination of the type and several additional specimens from Guatemala (*Johnson 678*, NY, US; *Steyermark 48781*, US; *Standley 71160*, US) indicates that it belongs in *Lellingeria* (Smith et al., 1991). *Lellingeria dissimulans* is similar to *L. randallii* (Maxon) A. R. Smith & R. C. Moran, from Panama and Jamaica, except that the rhizome scales are larger and lack marginal setae, and the blades completely lack hairs and setae on the lamina and rachis abaxially; the sori are somewhat impressed. The species is so far known only from Guatemala.

**Lellingeria hombersleyi** (Maxon) A. R. Smith, comb. nov. Basionym: *Polypodium hombersleyi* Maxon, Amer. Fern J. 20: 1. 1930. *Ctenopteris hombersleyi* (Maxon) Copeland, Philipp. J. Sci. 84: 430. 1956 [1955]. *Grammitis hombersleyi* (Maxon) Lellinger, Proc. Biol. Soc. Wash. 89: 714. 1977. TYPE: Trinidad. *Hombersley 331* (holotype, US).

This is known only from Trinidad and, like *L. dissimulans*, is also related to *L. randallii*.

**Melpomene gracilis** (Hooker) A. R. Smith, comb. nov. Basionym: *Polypodium gracile* Hooker, Bot. Misc. 2: 239. 1831. *Grammitis gracilis* (Hooker) Stolze, Fieldiana, Bot. 32: 96. 1993. TYPE: Peru. Pasco: Huayllay, *Cruckshanks s.n.* (holotype, K not seen; isotype, GH not seen).

**Melpomene zempoaltepetlensis** (Mickel & Beitel) A. R. Smith, comb. nov. Basionym: *Grammitis zempoaltepetlensis* Mickel & Beitel, Mem. New York Bot. Gard. 46: 205. 1988. TYPE: Mexico. Oaxaca: Dto. Mixe, NW slope of Cerro Zempoaltépetl, trail from Yacoche to Totontepec, *Mickel 4638* (holotype, NY).

I now believe this is sufficiently distinct from *M. pilosissima* to warrant species status. *Melpomene zempoaltepetlensis* differs in lacking setae at the margins of segments and appears to be confined to southern Mexico.

**Terpsichore bipinnata** (Stolze) A. R. Smith, comb. nov. Basionym: *Grammitis bipinnata* Stolze, Fieldiana, Bot. 32: 92. 1993. TYPE: Peru. Cuzco: Prov. La Convención, Loma Grande, *Bües 2167* (holotype, US not seen; isotype, F not seen).

**Terpsichore elastica** (Bory ex Willdenow) A. R. Smith, comb. nov. Basionym: *Polypodium elasticum* Bory ex Willdenow, Sp. Pl., ed. 4. 5: 183. 1810. *Ctenopteris elastica* (Bory ex Willdenow) Copeland, Philipp. J. Sci. 84: 426. 1956 [1955]. TYPE: Bourbon [Réunion]. *Bory s.n.* (holotype, B–Herb. Willd. 19675 not seen; microfiche, UC).

I have now seen sufficient material from Madagascar and the Seychelles to be convinced that this species is not synonymous with *T. cultrata* (Bory ex Willdenow) A. R. Smith, as previously thought (Smith, 1993). It differs by the narrower blades and by the absence of rhizome scales, thus agreeing with *T. mollissima* (Fée) A. R. Smith. *Terpsichore elastica* is the only known species in the genus from Africa and islands of the Indian Ocean. Like many of its neotropical congeners allied to *T. cultrata* (Group 3 of Smith, 1993), the spores are ellipsoid, monolete, and binucleate when shed (*van der Werff 12890*, UC, from Madagascar).

**Terpsichore flexuosa** (Maxon) A. R. Smith, comb. nov. Basionym: *Polypodium flexuosum* Maxon, Contr. U.S. Natl. Herb. 17: 597, t. 42. 1916. *Grammitis maxoniana* Lellinger, Amer. Fern J. 74: 58. 1984 (nom. nov., not *G. flexuosa* Kunth = *Eriosorus flexuosus*). *Lellingeria flexuosa* (Maxon) A. R. Smith & R. C. Moran, Amer. Fern J. 81: 84. 1991. TYPE: Cuba. Oriente: Camp La Gloria, S of Sierra Moa, *Shafer 8037* (holotype, US).

On the basis of descriptions, this species was mistakenly transferred to *Lellingeria* by Smith and Moran (in Smith et al., 1991). Examination of the type and other specimens from Cuba shows that *Terpsichore flexuosa* is closely related to *T. staheliana* (Posthumus) A. R. Smith, also with setose sporangia, and not *Lellingeria pendula* (Swartz) A. R. Smith & R. C. Moran, as Maxon thought.

Literature Cited

Bishop, L. E. 1988. *Ceradenia*, a new genus of Grammitidaceae. Amer. Fern J. 78: 1–5.

Mickel, J. T. & J. M. Beitel. 1988. Pteridophyte flora of Oaxaca, Mexico. Mem. New York Bot. Gard. 46: 1–568.

Smith, A. R. 1993. *Terpsichore*, a new genus of Grammitidaceae (Pteridophyta). Novon 3: 478–489.

——— & R. C. Moran. 1992. *Melpomene*, a new genus of Grammitidaceae (Pteridophyta). Novon 2: 426–432.

———, ——— & L. E. Bishop. 1991. *Lellingeria*, a new genus of Grammitidaceae. Amer. Fern J. 81: 76–88.

# *Arracacia ravenii* (Apiaceae), a New Species from Southern Mexico

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ABSTRACT. A new species of *Arracacia* (Apiaceae) is described from the high mountains of Chiapas and Oaxaca, Mexico. Although sharply distinct in many respects, it is contrasted with *A. pringlei* J. Coulter & Rose, the Oaxacan taxon it most closely resembles.

*Arracacia* Bancroft is one of the largest and most important apioid genera of Umbelliferae in the New World, not least because some of its members served as important food plants for the Incas. The genus is central to a number of other Mesoamerican genera, such as *Tauschia*, *Coaxana*, *Coulterophytum*, *Myrrhidendron*, and *Neonelsonia*, all of which have been confused with it in one way or another. It continues to yield well-marked but previously undescribed forms from throughout its extensive range. Attention is called to the following example to facilitate its inclusion in *Flora Mesoamericana*.

**Arracacia ravenii** Constance & Affolter, sp. nov. TYPE: Mexico. Chiapas: Municipio de Tenejapa, steep heavily wooded slope of Cerro Zontehuitz, with *Quercus*, *Drimys* & *Magnolia* on NE side of hill, paraje of Matsab, alt. 9200 ft. (2804 m), 25 Aug. 1966, *D. E. Breedlove 15311* (holotype, DH; isotype, UC). Figure 1a–f.

Species *Arracaciae pringlei* J. Coulter & Rose affinis sed habitu procumbenti, non glauco-caulibus, divisionibus foliorum confertis acutis non acuminatis, pedunculo solitario terminali, involucello evidenti, floribus flavo-virentibus, fructibus late ovoideis differt.

Slender, caulescent, branching, woody-based perennial herbs forming trailing mats to 60 cm long, the foliage glabrous, the inflorescence scaberulous; leaves triangular-ovate, 5–15 cm diam., ternate-bipinnate or 2–3-pinnately dissected, the ultimate divisions oblong-ovate to lanceolate, 5–15 mm long, 1–10 mm broad, crowded, sessile, acute, spinulose-serrate and pinnately incised toward base, the uppermost confluent, conspicuously reticulate, squamosely tufted on the rachis above, a well-defined nodal ring lacking; petiole 5–10 cm long, oblong-sheathing; cauline leaves numerous, like the basal; inflorescence of a solitary rather stout terminal peduncle 10–20 cm long; umbels 8–12 cm diam.; involucre lacking, or of inconspicuous filiform bracts; rays 12–18, mostly fertile, slender, 3.5–5 cm long, subequal, slightly webbed; umbellets 30–40-flowered, the 2–8 fertile pedicels slender, 5–10 mm long; involucel of 5–8 linear-lanceolate, scarious-margined, acuminate bractlets to 10 mm long, equaling flowers but shorter than fruit; flowers greenish yellow, the petals oval; stylopodium conical, the styles slender; carpophore apparently bipartite; fruit broadly ovoid, 4–5 mm long, 3–4 mm broad, glabrous, tapering at apex, the ribs very prominent; vittae large, usually solitary in intervals, 2 on commissure; seed channeled under intervals, the face sulcate; chromosome number unknown.

*Distribution*. Known only from mountains of central Chiapas (Cerro Zontehuitz) and southern Oaxaca (Cerro Zempoaltepetl).

*Habitat*. Steep slopes with *Quercus*, *Drimys*, *Magnolia*, *Ilex*, and *Podocarpus*, in wet montane or cloud forest, at 2400–3000 m.

*Arracacia ravenii* keys readily to the group of woody-based species comprising *A. fruticosa* Rose, *A. ebracteata* (Rose) Mathias & Constance, *A. aegopodioides* (Kunth) J. Coulter & Rose, and *A. pringlei* J. Coulter & Rose, more particularly the last. It differs from *A. pringlei* in its sprawling habit, green rather than glaucous stems and rachises, crowded leaf divisions, solitary terminal peduncle rather than terminally clustered peduncles, evident involucel, yellowish green rather than purple flowers, and broadly ovoid rather than oblong-fusiform fruit.

We are pleased to name the plant for Peter Raven, who, among so many other accomplishments, played a very significant role in initiating the *Flora of Chiapas* project.

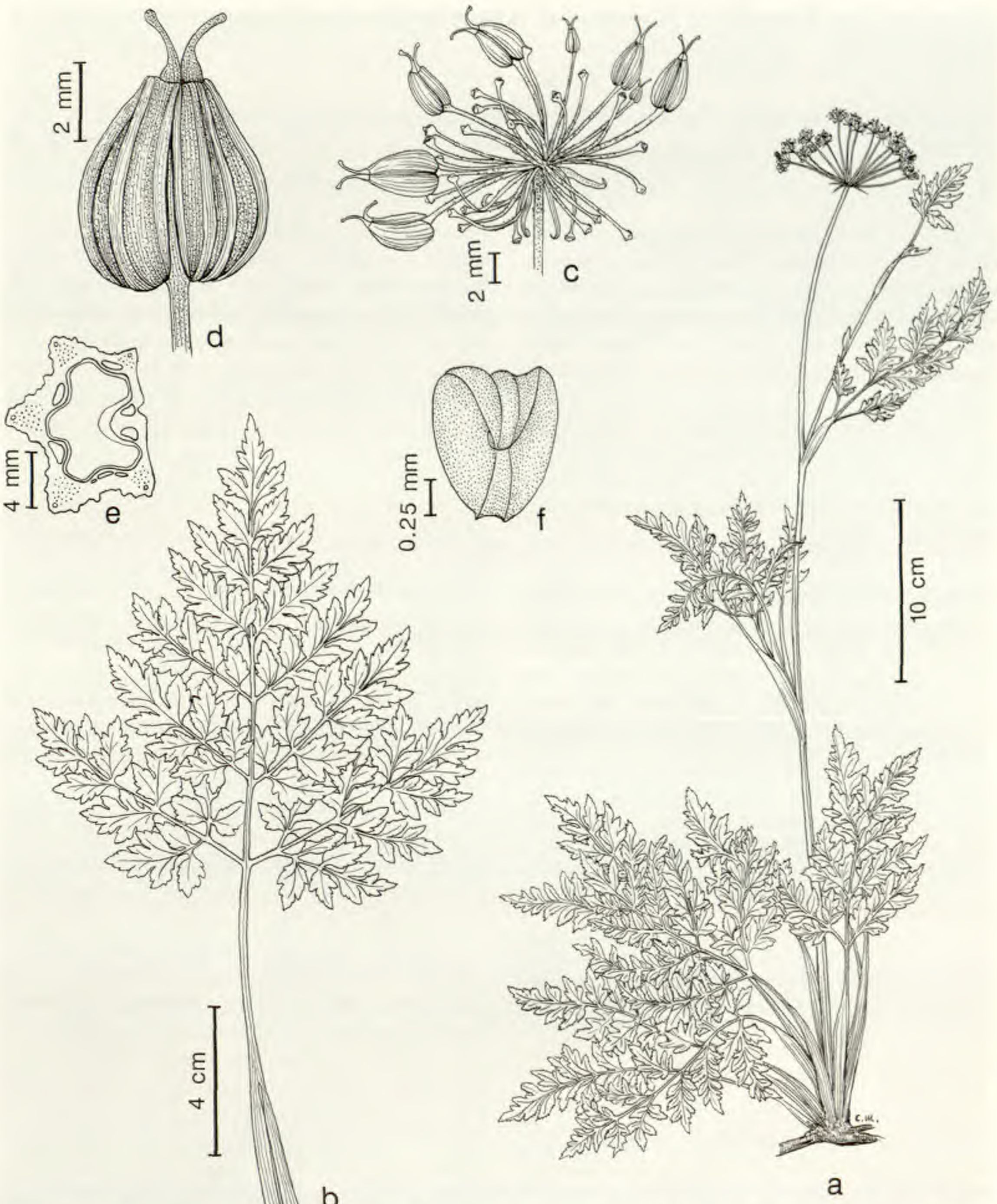


Figure 1. *Arracacia ravenii* Constance & Affolter. —a. Habit. —b. Basal leaf. —c. Fruiting umbellet. —d. Fruit, lateral view. —e. Mericarp transection. —f. Petal. (a, *Breedlove & Raven 8105;* b–f, *Breedlove 15311.*)

*Paratypes.* MEXICO. **Chiapas:** Mun. of San Cristobal las Casas, SW slope of Cerro Zontehuitz, 19 Jan. 1965, *Breedlove & Raven 8105* (DH, UC), 24 May 1965, *Breedlove 10020* (DH, MICH, UC); Santa Cruz en San Felipe, 15 Nov. 1986, *Ton & M. C. Mtz. de Lopez 9529* (MO); Mun of Tenejapa, slope at Paraje Matsab, 5 Jan. 1966, *Ton 487* (DH, UC); slope in Paraje Pahal Ton, 20 Jan. 1966, *Ton 668* (DH, UC), Cerro Sontehuits, Las Casas–Tenejapa, 28 June 1942, *M. C. Carlson 2411* (MEXU); summit of Cerro Tzonohuitz, 92°35′W, 16°49′N, 26 Mar. 1986, *Snow & Whittemore 212* (MO). **Oaxaca:** steep N slope of Cerro Zempoaltepetl, 35 km N of Ayutla, Mitla–Choapam, 17 Apr. 1988, *Breedlove & Bartholomew 66871* (CAS).

*Acknowledgment.* The figure was prepared by Charlotte Mentges Hannan.

# Two New Species of Araceae for the Guianas

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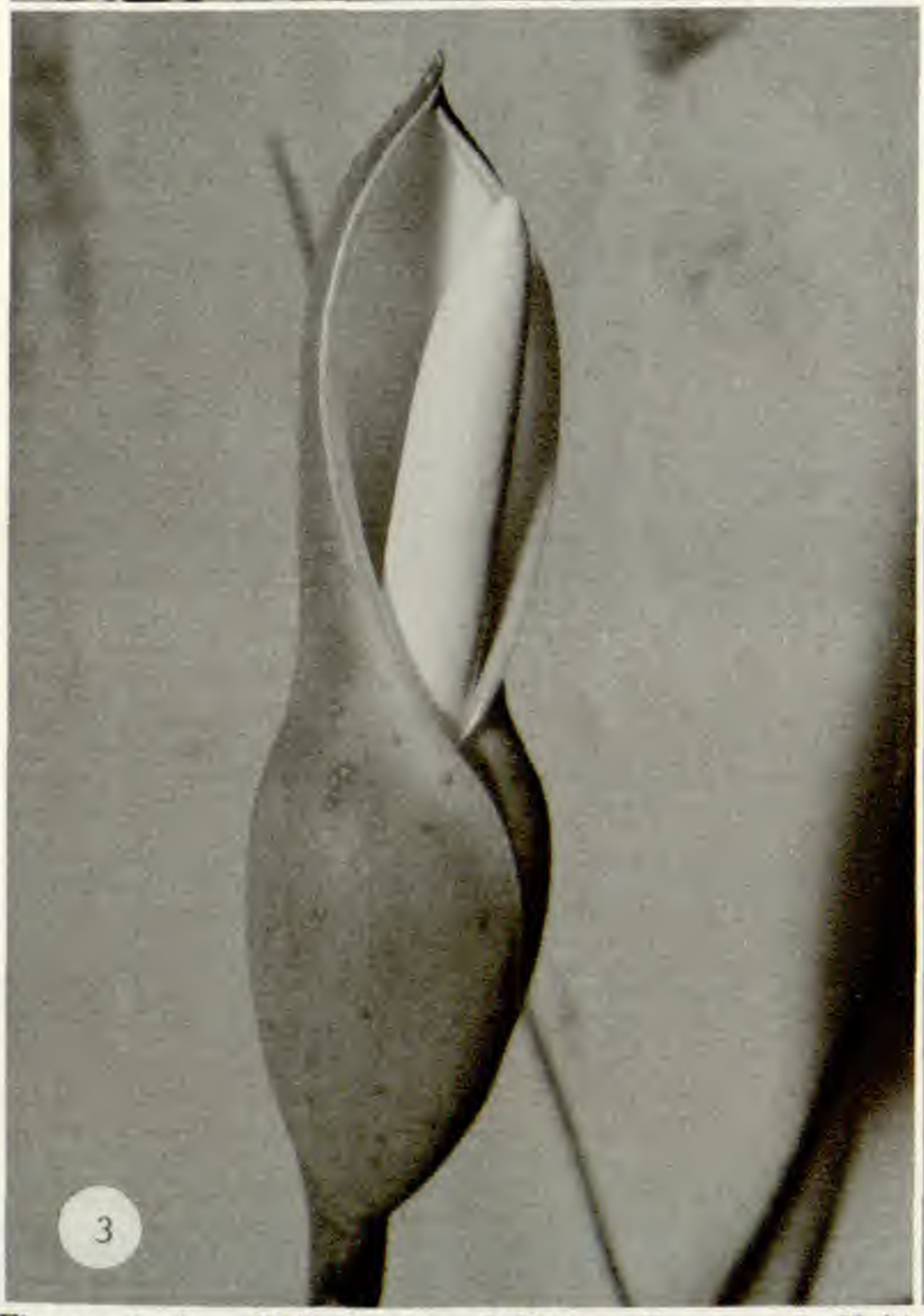
ABSTRACT. Two species of Araceae from the Guianas are described. *Philodendron billietiae*, known from Guayana, French Guiana, and Brazil, is most closely related to *P. acutatum*. *Xanthosoma granvillei*, known only from French Guiana, is distinguished mainly by its large, blackish-drying blades.

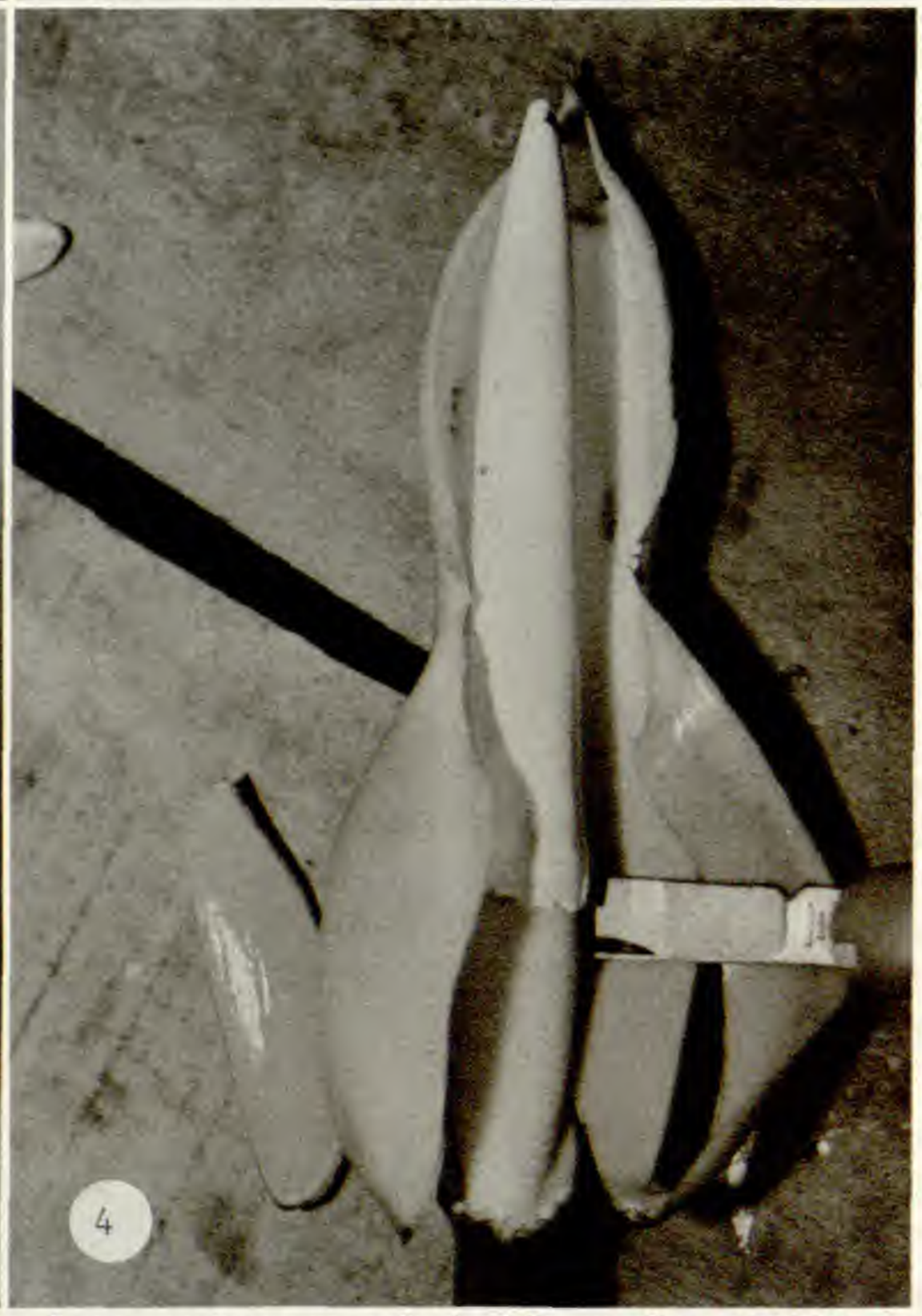
In order to complete the Araceae treatment for the *Flora of Saül* and the *Flora of the Guianas* it has become necessary to describe a number of new species. Descriptions of other new species of Araceae will follow.

**Philodendron billietiae** Croat, sp. nov. TYPE: French Guiana. National Hwy. 2, Cayenne–Regina, vic. km 93, 100–150 m, 4°18′N, 52°10′W, *Croat 74321* (holotype, MO 4343643-5; isotypes, B, BBS, BR, BRG, CAS, CAY, CM, F, G, GH, INPA, K, M, MG, NY, P, US, VEN). Figures 1–4.

Planta hemiepiphytica; internodia brevia, usque 2.5–5 cm diam.; petiolus subteres, 25–57 cm longus, pallide aurantiacus-flavus vel viridi-flavus; lamina plus minusve anguste triangularis et sagittata, 30–85 cm longa, 8.1–21 cm lata; nervis lateralibus primariis 3–5 utroque; pedunculus 9.4–27 cm longus; spatha 17.5–18.5 cm longa, extus viridis; lamina intus alba; tubus intus purpurascens; spadix 16.5–18 cm longus; ovaria 6–11 locularia cum ovulis plus quam 10 in quoque loculo; affinis *P. acutato* Schott sed internodis proportione brevioribus, petiolo in vivo flavido vel ochraceo versus constanter viridi, lamina proportione angustiore basique lobis 35–40° versus 60–75° divergentibus differt.

Appressed-climbing hemiepiphyte, sometimes on rocks; stems about 1 m long, sometimes longer; internodes shorter than broad, 2.5–5 cm diam., light brown with irregular, weak, reticulate to mostly transverse fissures, turning yellow-brown; petiole scars to 4.5 cm diam.; cataphylls sharply D-shaped near apex, otherwise terete and unribbed or sometimes bluntly 2-ribbed, green to pale orange (sometimes brown, orange at base) or reddish, promptly caducous; roots moderately few, stout, ca. 5 mm diam., purplish brown, drying smooth, semiglossy, the epidermis often fissured; leaves usually clustered near the end of the stem, with erect spreading petioles and pendent blades; petioles broadly spreading, 25–57 cm long, averaging 40 cm long, broadly sulcate at base, obtusely flattened toward the apex, weakly angular near the apex, sheathed 4–8 cm at the base, firm, olive green to golden-yellow, pale yellow-orange or greenish yellow, when fresh, somewhat asperous and rather densely purplish-lineate, drying light yellow-brown to dark brown, typically closely fissured; blades pendent, narrowly triangular to narrowly ovate-triangular to oblong-triangular, 30–85 cm long, 8.1–21 cm wide (averaging 52 × 15 cm), 2.7–4 times longer than wide, averaging 3.4 times longer than wide, broadest at the base or near the petiole attachment, sometimes weakly constricted above the petiole attachment, 0.85–1.4 times as long as the petioles (averaging 1.07 times longer than petioles), moderately coriaceous, dark green and semiglossy above, much paler and matte to weakly glossy below; the margins often weakly undulate, hyaline or reddish; posterior lobes directed at about 170° from the midrib (the two lobes separated by an angle of 35–40°), sometimes directed up slightly at an angle to the midrib, 8–22 cm long, 3–10 cm wide, about twice as long as wide; sinus much longer than wide, acute at apex, usually barely naked along the margin, but sometimes weakly naked up to 2.5 cm (the leaf tissue merging almost imperceptibly with the posterior rib); midrib flat to very broadly raised and paler (sometimes orange-yellow) with purplish dots above, narrowly raised and convex, yellow-brown to yellow-red or yellow-green below; primary lateral veins 3–5, widely spaced and usually not prominent, weakly sunken to flat and yellow-green above, convex to weakly raised and sometimes reddish to purplish below, arising at 70–105° angle, mostly at nearly 90° angle, sometimes prominently down-turned at the midrib, sometimes splayed out at the midrib; minor veins numerous, moderately distinct when fresh, weakly raised above, flat and distinctly visible below, drying prominulous on both surfaces, with alternate veins frequently turned to join another minor vein just before the margin; cross veins inconspicuous; young leaves reddish. Inflorescences 1–3 per axil, erect; peduncle 9.4–27 cm long, ca. 1 cm diam., somewhat flattened, ribbed on one side, medium yellow-green, green-lineate to purplish-lineate; spathe 17.5–18.5 cm long, yellow-green to dark green outside, slightly paler toward apex, densely pale purplish-lineate on




Figures 1–4. *Philodendron billietiae* Croat. —1. Habit, plant creeping over rocks in full sun; *Croat 74230.* —2. Close-up of stem showing old intact cataphyll and leaf scars, roots, and petioles; *Moonen s.n.*, cultivated in Cayenne. —3. Inflorescence at anthesis showing male portion of spadix barely emergent; *Moonen s.n.* —4. Open inflorescence; *Moonen s.n.*

tube, dark purplish-lineate on blade, the outer margin of the tube slightly paler, the blade white to greenish white within, the margins weakly turned back at anthesis; tube sometimes reddish-spotted outside, mauve to maroon within, becoming dark maroon-purple within after anthesis with conspicuous, closely spaced resin canals restricted to the area of the constriction, blending in with the red of the tube and the white of the blade; spadix 16.5–18 cm long; staminate portion white, to 9 cm long, to 11 mm diam. at base, weakly constricted to ca. 9 mm somewhat above the sterile portion, tapered to the narrowly rounded apex; pistillate portion pale green, to 7.2 cm long on front side, 5.3 cm long on back side; pistils ca. 3 mm long, pale yellow-green, turning pale yellow post-anthesis; ovaries 6–11-locular; ovules more than 10 per locule; sterile male flowers broader than the pistillate portion, scalloped and undercut at base, 2.2 cm diam., 10–11 mm long; fertile portion constricted 8.5 cm above base, creamy white, bluntly pointed at apex.

*Philodendron billietiae* is known from Guyana, French Guiana, and Brazil (Pará) in tropical rainforest at 140 to 340 m elevation; certainly it is to be expected in Suriname as well. In Brazil it has been collected only near Belém, and only a live collection cultivated at the Moscow Main Botanical Garden has been seen.

The species is a member of *Philodendron* subg. *Philodendron* (formerly *Polyspermium*) and is characterized by its long, mostly triangular leaf blades with a very narrow sinus, elongated posterior lobes, relatively few, widely spaced primary lateral veins, and especially by its greenish yellow or pale orange petioles, which are about as long as the blade.

*Philodendron billietiae* was first collected by H. A. Gleason of the New York Botanical Garden in 1921 in Guyana, where it has not been collected subsequently. It is named in honor of Frieda Billiet of the Jardin Botanique National de Belgique, Meise, who studied the species at several localities in French Guiana, brought it into cultivation, and first brought it to my attention. The species is in cultivation in the botanical garden at Meise, as well as at the Missouri Botanical Garden and the Moscow Main Botanical Garden.

*Philodendron billietiae* is most easily confused with and probably most closely related to *P. acutatum* Schott, a similar species with which it may occur. *Philodendron acutatum* differs in having proportionately longer internodes, consistently medium green petioles, and proportionately wider, mostly narrowly ovate blades that often have the posterior lobes divergent from one another at an angle of 60° or more. In addition, *P. acutatum* is ecologically different from *P. billietiae* in French Guiana, occurring principally in the coastal swamp forests with *Avicennia*.

*Paratypes.* FRENCH GUIANA. Pic Coudreau-Mont Bakra, Région des Emérillons, 670 m, 3°18′N, 52°57′W, *de Granville & Cremers 11833* (CAY, MO, P, U, US); Savane Roche de Virginie-Approuague River basin, 140 m, 4°11′N, 52°9′W, *Cremers & Petronelli 11683* (CAY, K, MO, P, U); Montagnes de Kaw, 4°33′N, 52°09′W, *Cremers 12718* (CAY); Montagnes de Kaw, along road to Montagne Favard, vic. jct. to Fourgrassie, 200 m, 4°38′N, 52°17′W, *Croat 74335* (CAY, K, MO, US); Route Nationale, RN 2, 4°35′N, 52°20′W, *Cremers 12723* (CAY); km 95.5, *Prevost 1739* (CAY); km 67, Crique Tibourou, along old route for RN 2, 5 m, 4°29′N, 52°19′W, *Billiet & Jadin 5740* (B, BR, CAY, K, MO, NY); km 93, 100–150 m, 4°18′N, 52°10′W, *Croat 74321* (B, BR, CAY, K, NY, MG, P, US, VEN); road to Montagnes de Kaw, km 34, 4°33′N, 52°09′W, 340 m, *Billiet & Jadin 4600* (BR); La Compte River, vic. km 40 on RN 2, 4°N, 52°21′W, *Billiet & Jadin 4714* (BR, CAY, MO); between La Compté & Cacao, S of Cayenne, 1981, *Billiet 81-0879* (BR), *Croat 76441* (MO); Saül, vic. Eaux Claires, Sentier Botanique near headwaters of St. Eloi River, 350 m, *Croat 74230* (CAS, CAY, CM, M, MO, W). GUYANA. Rockstone, *Gleason 846* (GH).

In addition to the localities listed above, the species has been seen in French Guiana on the road to Petit Saut, km 20 (F. Billiet, pers. comm.).

**Xanthosoma granvillei** Croat & Thompson, sp. nov. TYPE: French Guiana. Saül, vic. Eaux Claires, along road between Eaux Claires and Bélizon, 230 m, 3°37′N, 53°12′W, *Croat 74131* (holotype, MO-4342303; isotypes, B, CAY, CM, K, NY, P, US). Figures 5–8.

Planta terrestris; caulibus 15–30(–50) cm longis; internodia usque 6(–15) cm diam.; petiolus teres, 39–75(–100) cm longus; lamina ovato-hastata, 19–70 cm longa, (16–)21–50 cm lata, 2.1–2.3 plo longior quam lata, in sicco subdenigrata; cum costa postica nuda 1.0–5.5 cm; nervis primariis lateralibus 3–6 utroque; inflorescentiae 3–6 per axila; pedunculus 8–30 cm longus; spatha 11.5–20 cm longa; tubus 4.5–6.5 cm longus, extus viridus, intus atropurpureus; lamina 8–8.5 cm longa, extus et intus albida; spadix usque 18 cm longus, parte pistillata plus minusve aurantiaca; ovaria 2–3 locularia, loculi 2–3 ovulati; fructus aurantiacus.

Terrestrial; stems rhizomatous, the older portion creeping over ground, the younger portion erect, 15–30(–50) cm long; internodes short, to 6(–15) cm diam.; cataphylls to 25 cm long, persistent, turning dark brown, the uppermost persisting semi-intact; petioles 39–75(–100) cm long, terete but somewhat flattened near apex, succulent and juicy, tinged purplish at base, sheathed usually less than ¼ its length (up to 20 cm when subtending an inflorescence); blades ovate-hastate, 19–70 cm long,

Figures 5–8. *Xanthosoma granvillei* Croat & Thompson; *Croat 74131.* —5. Habit showing an inflorescence and an emerging new leaf. —6. Stem with old persistent leaf sheaths. —7. Leaf blade. —8. Close-up of inflorescence showing an unopened spathe.

(16–)21–50 cm wide, 2.1–2.3 times longer than broad, prominently lobed at base, acuminate at apex, dark green and semiglossy above, moderately paler and weakly glossy below, drying somewhat blackened, dark olive-green above, dark brownish green below; the lateral margins usually convex, rarely concave; posterior lobes 1.2–1.8 times longer than wide, subacute at apex, sometimes turned weakly outward, often held somewhat upward at an angle to the midrib; sinus hippocrepiform or sometimes obovate, 9–19 cm deep; posterior rib straight and extending outward at ca. 60° angle to the midrib, naked 1–5.5 cm along sinus; basal veins 6–9 pairs, the uppermost free, the remainder pinnately arranged along the posterior rib; primary lateral veins 3–6 pairs, arising at 40–60° angle; minor veins weakly etched above, flat and darker than surface below. Inflorescences 3–6 per axil; peduncle greenish, 8–30 cm long, longer than or shorter than the spathe; spathe 11.5–20 cm long, constricted at lower ⅓, the tube 4.5–6.5 cm long, the blade white, sometimes lined with pink, the tube green outside, sometimes tinged purplish, dark purple within, sometimes becoming deep red outside; spathe blade 8–8.5 cm long, whitish on both surfaces; spadix to 18 cm long, several centimeters shorter than spathe, female portion bright orange to yellow-orange; ovaries 2–3-locular; locules usually 2–3-ovular. Infructescences with peduncles to 22 cm long, fruiting spathe to 7 cm long, fruiting spadix 3.5–4.5 cm long, 2–2.5 cm diam. Fruits orange; immature seeds 1.6–1.8 mm long, 1 mm diam., obtuse at apex, cordulate at base, ca. 10-ribbed longitudinally. Very common and conspicuous in wet season but surviving as an underground stem during the dry season.

*Xanthosoma granvillei* is known only from French Guiana, mostly between 200 and 500 m, but rarely to nearly sea level; it is to be expected in adjacent Suriname. The species was first collected in 1966 by Oldeman at Cacao, south of Cayenne. It is named for Jean Jacques de Granville from ORSTOM, in Cayenne, who collected more well-prepared specimens of the species than any other collector.

*Xanthosoma granvillei* is recognized by its short stems emerging usually only a short distance above the ground level, its ovate-cordate, blackish-drying blades with triangular posterior lobes, sunken minor veins, and a partly naked, usually hippocrepiform sinus. Additionally, the cluster of 3–6 inflorescences with peduncles about as long as the spadix, with orange female spadices, distinguish it from other species of *Xanthosoma*.

*Xanthosoma granvillei* is most easily confused with another blackish-drying species that also appears to be new to science. That species differs by having tuberous growth, smaller, more hastate leaf blades, and an inflorescence with slender peduncles that are 3–4 times longer than the spathe. It is represented by collections from the Montagnes de Kaw (*Cremers 2719, 8702*) and from the nearby region at Crique Armontabo, a tributary of the Oyapock River (*Cremers 7055*). It will be described later.

*Xanthosoma granvillei* might also be confused with *X. undipes* K. Koch & Bouché, which differs in having a longer stem, foul-smelling sap, and blades that dry greenish rather than blackened. Superficially, *X. granvillei* is very similar to *X. bolivaranum* Bunting from the El Dorado–Gran Sabana area of Venezuela. That species, described from sterile material, has similar stems and blades but differs in having obtusely sulcate petioles sheathed to about the middle (versus merely obtusely flattened and usually less than ¼ its length for *X. granvillei*), and leaf blades that dry gray-green above and light yellow-green below (not at all blackened). In addition, *X. bolivaranum* lacks any obvious lateral veins directed off the posterior rib toward the base, whereas *X. granvillei* has 2–3 prominent lateral veins branched off the posterior rib and directed toward the base.

*Paratypes.* FRENCH GUIANA. Cacao, 60 km S of Cayenne, *Oldeman B-450* (P); Montagne Cacao, SE of Cayenne, *Cremers 13031* (CAY, MO), *Feuillet 548* (CAY); Basin de la Comté River basin, 4°34′N, 52°27′W, *Cremers 12728* (CAY); Région de Paul Isnard, Citron Petite piste Boeuf Mort, *Feuillet 653* (CAY, K); Mont Atachi Bacca–Inini River region, 9 km SE of Gobaya Soula, 420 m, 3°33′N, 53°55′W, *de Granville et al. 10649* (CAY, K); E of Gobaya Soula, 440 m, 3°33′N, 53°55′W, *de Granville et al. 10482* (B, CAY, FTC, K, US); Montagnes de Kaw, road to Montagne Trésor, side trail to Placer Trésor, 4°35′N, 52°18′W, 150 m, *Croat 74283* (CAY, MO); Montagnes de Kaw, Cascade de Fourgassié, 4°37′N, 53°18′W, *Cremers & Feuillet 12968* (CAY, MO); Montagnes de Kaw, road to Dégrad Lalanne, 300 m, 4°34′N, 52°10′W, *Hoff et al. 6308* (CAY); Station des Nouragues, *Prevost 2503* (CAY); Saül, Mont Galbao, 550 m, 3°36′N, 53°17′W, *de Granville et al. 8608* (B, CAY, K, NY, P, U, US), 500 m, *de Granville et al 8837* (CAY, K, US); Saül, in village, jardín de Richard, *Capus 2* (CAY); 10 km SSW of village, *de Granville 5420* (BR, CAY, K, P); 18 km S of village, *de Granville 5531* (BR, CAY, K, P); Saül, Pied de Mont Galboa, 200 m, 3°37′N, 53°16′W, *de Granville et al. 9042* (CAY); Mont La Fumée, 3°37′N, 53°12′W, *Mori & Pipoly 15575* (NY); Saül, Fumée, *Prévost 1798* (MO); Saül, La Fumée Mountain trail, 250 m, *Mori & Gracie 18865* (NY); Mont Galboa, 10 km SW of Saül, 650 m, *de Granville 2401* (CAY, P); Saül, road to Eaux Claires, 250 m, *Mori & Gracie 21083* (NY); Saül, vic. Eaux Claires, along road between Eaux Claires and Bélizon, 220–240 m, 3°37′N, 53°12′W, *Croat 74131* (B, CAY, CM, K, MO, NY, P,

US), *de Granville 4480* (K); Saül, road to Bélizon, 0–2 km S of Eaux Claires, *Mori et al. 22194* (MO, NY); Saül, Grand Boeuf Mort trail, 300 m, *Mori & Gracie 18935* (CAY, NY); vic. Saül, trail to Mont Galboa, *de Granville 4486* (CAY, K); Rte. de Bélizon, km 7.7, 4°20′N, 52°23′W, *Billiet & Jadin 4424* (BR, CAY); Saül, ENE of village, Pic Matecho, *Cremers 6184* (CAY, K); Saül Region, Saut Quaimicouaré, Yaroupi River (tributary of the Oyapock), *de Granville 345* (P); Bassin du Sinnamary, Crique Kourcibo, Saut Kawène, 12 m, 4°53′N, 53°3′W, *Hoff et al. 6475* (CAY, MO); Chemin de fer Gare–Tigre–St. Elie, km 0–5, 20 m, 4°57′N, 53°8′W, *Hoff et al. 6585* (CAY, MO).

# *Paspalum niquelandiae* (Poaceae: Paniceae), a New Species from the Serpentine Outcrops of Central Brazil

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ABSTRACT. *Paspalum niquelandiae* Filgueiras, a new species of Poaceae from the serpentine outcrops of Niquelândia, a municipality in the Brazilian state of Goiás, is described, illustrated, and compared with *Paspalum soboliferum* Chase, *P. humboldtianum* Flugge, and *P. inconstans* Chase. The conservational importance of a serpentine endemic grass flora in central Brazil is briefly discussed.

Recent fieldwork carried out in the municipality of Niquelândia, in the Brazilian state of Goiás, where serpentine soils have been reported (Brooks et al., 1990), resulted in the description of several new taxa in the Poaceae (Davidse & Filgueiras, 1993; Filgueiras et al., 1993; Filgueiras & Davidse, 1994). A new species of *Paspalum* L. from the same area is herein described, illustrated, and compared to similar species.

**Paspalum niquelandiae** Filgueiras, sp. nov. TYPE: Brazil. Goiás: Municipio de Niquelândia, ca. 14°18′S–48°23′W, morro pedregoso, ca. 2 km Leste da localidade de Macedo, planta crescendo entre pedras, próximo a pequena floresta de galeria, ocasional na área, 19 maio 1993, *T. S. Filgueiras & F. C. de A. Oliveira 2461* (holotype, IBGE; isotypes, F, G, ICN, K, MEXU, MG, MO, R, SI, SP, US). Figure 1.

*Paspalo sobolifero* Chase spiculis ellipticis subtiliter pilosis, gluma superiore marginibus ciliatis simile, sed culmis non ramosis, ligula 0.2–0.3 mm longa, laminis 20–45 cm longis et 8–22 mm latis, communi rhachidi 9–15 cm longa, gluma superiore ciliis densis, numerosis, coroniformibus abunde differt.

Coarse, caespitose perennial. Rhizomes well developed, knotty, covered with cataphylls. Culms 120–185 cm tall, erect, unbranched in the vegetative portion, with 5–8 elongated internodes; internodes hollow, stramineous, glabrous; nodes dark, glabrous. Prophyll not seen. Leaves mostly cauline; sheaths strongly striate, glabrescent to pilose in the lower half, becoming papillose-hispid upward, the margins free, both ciliate or one glabrous toward the base; auricles absent; ligule a minute, brown, glabrous membrane, v-shaped, 0.2–0.3 mm long; cilia at the ligular area 5–8 mm long, colorless; blades 20–45 cm long, 8–22 mm wide, flat, lanceolate, glabrescent to papillose-hispid, acuminate apically, the midrib projecting abaxially, the margins serrate-denticulate to ciliate; uppermost blade reduced, minute. Inflorescence of unilateral, ascending racemes, divergent in maturity; peduncle well exserted, 12–22 cm long, glabrous; common rachis 9–15 cm long, glabrous, cylindrical at the base, becoming 3–4-angulate upward, the margins denticulate, the internode at the base of each raceme with a tuft of colorless hairs 2–2.5 mm long; racemes 8–30, 2.5–8.5 cm long; rachis 1–1.5 mm wide, zig-zag, flat abaxially, with a central ridge adaxially, arcuate in maturity, bearing spikelets to the tip, the margins ciliate or denticulate, or both. Pedicels of unequal length, 0.1–0.3 mm long, scabrid, the apex discoid. Spikelets paired, each pair alternate on each side of the rachis, pedicelled, 2.3–3.3 mm long, 1–1.2 mm wide, broadly elliptic-lanceolate in outline, pale to purplish, dorsally compressed, abaxial, awnless, with 2 florets, disarticulating below the glume and falling as a unit; lower glume absent; upper glume slightly to strongly convex on the back, 2.3–3.3 mm long, 3-nerved, glabrous to finely appressed pubescent, the margins densely ciliate-pectinate; the cilia colorless, 0.3–0.7 mm long, with bulbous bases, the apex apiculate; lower floret sterile, consisting only of a lower lemma; lower lemma 2.2–2.9 mm long, narrower than the upper glume, 3-nerved, navicular, hyaline, with a depressed area at the base, the surface glabrous to short-pubescent, the apex glabrous to slightly ciliate; lower palea absent; upper floret 2.2–2.7 mm long, bisexual, slightly chartaceous, pale; upper lemma obscurely 5-nerved, navicular, glabrous, the surface finely papillose-striate, the apex acute; germination flap evident; upper palea 2.1–2.2 mm long, acuminate, glabrous, slightly chartaceous, the surface finely papillose-striate; lodicules 2, fleshy, conduplicate, 0.1–0.2 mm long; stamens 3; anthers 1.2–2 mm long, laterally exserted; ovary 0.5–0.8 mm long, glabrous; styles 2, separate, 1.5–1.8 mm long; stigmas 2, plumose, yellow or purplish. Caryopsis 1.8–1.9 mm long, 0.9–1 mm wide, light-colored,

Figure 1. *Paspalum niquelandiae* Filgueiras, illustrated from the type collection (*Filgueiras & Oliveira 2461* ). —A. Habit. —B. Ligular area of leaf. —C. Portion of a raceme with paired spikelets. —D. Dorsal view of spikelet. —E. Upper floret, lemma side. —F. Upper floret, palea side.

TABLE 1. Main distinguishing characteristics of *Paspalum niquelandiae*, *P. humboldtianum*, and *P. soboliferum*.

| Character | *P. niquelandiae* | *P. humboldtianum* | *P. soboliferum* |
|---|---|---|---|
| Habit | Erect | Reptant | Erect |
| Height (cm) | 120–185 | 40–120 | ca. 60 |
| Culm | Unbranched | Branched | Branched |
| Nodes | Glabrous | Pilose | Glabrous |
| Ligule (mm) | 0.2–0.3 | 1.8–3.8 | 2–2.5 |
| Blades (cm × mm) | 20–45 × 8–22 | 1–8 × 6–17 | 5–15 × 6–9 |
| Common rachis (cm) | 9–15 | 1.5–6 | 4–6 |
| Number of racemes | 8–30 | 1–8 | 3–7 |
| Raceme length (cm) | 2.5–8.5 | 4–10 | 2–4.5 |
| Rachis width (mm) | 1–1.5 | 1–3 | 1–1.2 |
| Spikelet size (mm) | 2.3–3.3 | 3–4 | 2.8–2.9 |
| Cilia on glume (mm) | 0.3–0.7 | 1.9–2.1 | 0.4–0.5 |

with persistent stylar bases; embryo $\frac{2}{5}$–$\frac{1}{2}$ as long as the caryopsis; hilum punctate, basal, $\frac{1}{10}$–$\frac{1}{5}$ as long as the caryopsis.

*Paspalum niquelandiae* is morphologically most closely related to *Paspalum soboliferum* Chase because of the shape of the spikelets and especially because of the cilia on the margins of the upper glume; it differs in the unbranched culms, smaller ligule, longer blades, longer common rachis, greater number of racemes, and size and density of the cilia on the margins of the upper glume. *Paspalum soboliferum* is known only from a single plant (the holotype) from Ecuador (Hitchcock, 1927). The new species is more distantly related to *Paspalum humboldtianum* Flugge; the latter is readily distinguished by its sprawling habit, the pilose nodes, the size of the ligule, blades, and common rachis, and the number of racemes. *Paspalum humboldtianum* occurs from Mexico to Argentina (Chase, 1929). Table 1 summarizes the main differences among *P. niquelandiae*, *P. humboldtianum*, and *P. soboliferum*. It is evident from Table 1 that these species form a trio of closely related species with some overlapping characteristics, but whose distinctiveness is also readily apparent.

The spikelet shape and the ciliate lower lemma remotely link *Paspalum niquelandiae* to *P. inconstans* Chase, a species from Bolivia, Ecuador, and Peru. The latter is of smaller stature (culms 50 to 60 cm high), has both terminal and axillary racemes, and possesses a lower number of racemes (1 to 8, but commonly 2 to 5). A further distinguishing characteristic is the presence of a lower glume in the lower spikelets of *P. inconstans* (occasionally lacking in some spikelets). In addition, the cilia on the lower lemma of *P. inconstans* are smaller and much less dense than in *P. niquelandiae*.

The classification of *Paspalum niquelandiae* is not yet clear. It is obviously related to a group of species included by Chase in her unpublished monograph of the South American species of *Paspalum* [accessible from the Hitchcock & Chase Grass Library of the Department of Botany, Smithsonian Institution, Washington, D.C., U.S.A] in subgenus *Ceresia* (Persoon) Reichenbach. This group of species (which includes *Paspalum bicilium* Mez, *P. carinatum* Kunth, *P. polyphyllum* Nees, among others) has a characteristic upper glume with conspicuous marginal cilia. The inclusion of *P. niquelandiae* in subgenus *Ceresia* is not acceptable because this would make the subgenus exceedingly heterogeneous. Although related to some species in subgenus *Ceresia*, *P. niquelandiae* is best left ungrouped until more convincing evidence of relationships becomes available.

*Paspalum niquelandiae* is known from two populations in the municipality of Niquelândia in the Brazilian state of Goiás. It is apparently restricted to the serpentine outcrops in the area. It grows in scattered clumps among rocks and boulders, near the edge of some gallery forests, but was never found inside the gallery forest itself. Although the clumps seen were rather robust and, therefore, easy to spot, large populations of the species were never located.

This is the third species of *Paspalum* described from the locality of Macedo in Niquelândia. The other two are *P. longiaristatum* Davidse & Filgueiras (Davidse & Filgueiras, 1993) and *P. biaristatum* Filgueiras & Davidse (Filgueiras & Davidse, 1994). *Ophiochloa* Filgueiras, Davidse & Zuloaga, a panicoid grass genus, has also been recently described from the same area (Filgueiras et al., 1993). The discovery of so many new taxa in such a small area (ca. 3 km$^2$) in central Brazil suggests that Niquelândia is a center of high plant diversity and

endemism, primarily due to the presence of serpentine soils, with their high concentrations of nickel, chromium, cobalt, and other minerals (Brooks, 1987).

The presence of a highly specialized flora in Niquelândia is of utmost concern because the area is the center of the largest nickel mining and smelting operation in Brazil (Brooks et al., 1990). There is not a single conservation unit in the area to grant legal protection to this unique flora. A detailed botanical survey should be undertaken in the region to assess the diversity of the entire flora and its level of endemism. The conservational implications of the presence of such a peculiar flora in Niquelândia will be addressed in a forthcoming publication.

The specific epithet refers to the town of Niquelândia, in whose municipality the new species was collected.

*Paratypes*. BRAZIL. **Goiás:** municipio de Niquelândia, ca. 1 km Leste da localidade de Macedo, morro pedregoso, 19 maio 1993, *T. S. Filgueiras & F. C. de A. Oliveira 2456* (IBGE, RB, UB), 4 ago. 1992, *T. S. Filgueiras & R. D. Lopes 2427* (B, IBGE).

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Literature Cited

Brooks, R. R. 1987. Serpentine and Its Vegetation. Dioscorides Press, Portland.

Brooks, R. R., R. D. Reeves, A. J. M. Baker, J. A. Rizzo & H. D. Ferreira. 1990. The Brazilian serpentine expedition (Braspex). 1988. Natl. Geogr. Res. 6: 205–219.

Chase, A. 1929. The North American species of *Paspalum*. Contr. U.S. Natl. Herb. 28: 1–310.

Davidse, G. & T. S. Filgueiras. 1993. *Paspalum longiaristatum* (Poaceae: Paniceae), a new serpentine endemic from Goiás, Brazil, and the first awned species in the genus. Novon 3: 129–132.

Filgueiras, T. S. & G. Davidse. 1994. *Paspalum biaristatum* (Poaceae: Paniceae), a new serpentine endemic from Goiás, Brazil, and the second awned species in the genus. Novon 4: 18–22.

———, ——— & F. O. Zuloaga. 1993. *Ophiochloa*, a new endemic serpentine grass genus (Poaceae: Paniceae) from the Brazilian cerrado vegetation. Novon 3: 360–366.

Hitchcock, A. S. 1927. The grasses of Ecuador, Peru, and Bolivia. Contr. U.S. Natl. Herb. 24: 291–556 [*Paspalum*, contributed by Agnes Chase, pp. 434–455].

# A New Combination in *Peltostigma* (Rutaceae)

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ABSTRACT. *Peltostigma parviflorum* Q. Jiménez & Gereau is reduced to synonymy under *P. guatemalense* (Standley & Steyermark) Gereau, comb. nov., based on *Galipea guatemalensis* Standley & Steyermark.

*Peltostigma* Walpers (Rutaceae: Rutoideae) belongs to subtribe Choisyinae of the tribe Zanthoxyleae, while *Galipea* Aublet (Rutaceae: Rutoideae) belongs to subtribe Cuspariinae of the tribe Cuspareieae. The two subtribes may be contrasted as follows (Engler, 1931):

Choisyinae: flowers actinomorphic; corolla polypetalous; stamens all antheriferous; seeds with endosperm.

Cuspariinae: flowers usually zygomorphic; corolla usually gamopetalous; some stamens often reduced to staminodes; seeds with little or no endosperm.

*Peltostigma parviflorum* Q. Jiménez & Gereau is the only species of the genus with unifoliolate leaves and small flowers (petals 8.2–10.1 mm long) (Jiménez & Gereau, 1991); its congeners (*P. pteleoides* (Hooker) Walpers and *P. eximium* C. V. Morton) possess 3–5-foliolate leaves and large flowers (petals 15–25 mm long) (Morton, 1933; Standley & Steyermark, 1946). *Galipea guatemalensis* Standley & Steyermark was named from a fruiting specimen lacking the floral characters necessary for correct generic (or even subtribal) placement in the Rutaceae. Examination of its holotype has shown that *G. guatemalensis*, an earlier name, is the same species as *P. parviflorum*, necessitating the following new combination.

**Peltostigma guatemalense** (Standley & Steyermark) Gereau, comb. nov. Basionym: *Galipea guatemalensis* Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser. 23: 165. 1944. TYPE: Guatemala. Izabal: Río Dulce, between Livingston and 6 mi. upriver, on N side, 1–25 m, 14 Apr. 1940 (fr), *Steyermark 39448* (holotype, F).

*Peltostigma parviflorum* Q. Jiménez & Gereau, Ann. Missouri Bot. Gard. 78: 527. 1991. Syn. nov. TYPE: Costa Rica. San José: 9°43′10″N, 84°23′10″W, Zona Protectora La Cangreja, Santa Rosa de Puriscal, 400–500 m, 4 sep. 1987 (fl), *Q. Jiménez M. & L. J. Poveda A. 494* (holotype, CR; isotypes, K, MO).

Jiménez & Gereau (1991) discussed geographical trends in the morphology of *Peltostigma guatemalense* (as *P. parviflorum*) in terms of a "northern race" consisting of the collections from Guanacaste and Puntarenas, Costa Rica, and a "southern race" comprising the type and four collections from Antioquia, Colombia. The "races" may be contrasted as follows: "Northern race": petioles 0.2–2.1 cm long, not extremely variable, the longest in a given specimen exceeding the shortest by 0.5–1.5 cm; leaflet blade 3.2–16.0 × 1.2–7.3 cm, the apex obtuse or obtusely acuminate, the base acute to rounded; petals 8.2–9.3 × 8.0–8.5 mm. "Southern race": petioles 0.3–5.6 cm long, extremely variable, the longest in a given specimen exceeding the shortest by 2.0–4.5 cm; leaflet blade 4.2–20.6 × 2.2–10.2 cm, the apex acutely acuminate, the base usually attenuate; petals 9.8–10.1 × 8.5–9.7 mm.

The type of *Galipea guatemalensis* has larger leaflets (to 19.5 × 8.7 cm) and longer petioles (to 2.6 cm) than is characteristic for the "northern race," but is otherwise more similar in foliar characters to the northern than to the southern populations. A previously unreported collection of this species from Peru has foliar characters entirely within the parameters of the "southern race," but insufficiently mature flowers to assess the correlation between geography, floral measurements, and foliar characters. With few collections and little available data on flower size, it is preferable to continue to consider *Peltostigma guatemalense* a single species with some observable correlation between geography and morphological characters. Further investigations based on more ample collections could reveal the desirability of recognizing the two informal "races" as subspecies.

*Specimen examined.* PERU. **Madre de Dios:** Manú, Parque Nacional Manú, Río Manú, Pakitsa station, Tachigali Trail, 4 km N of camp, 11°56′S, 71°16′W, 350 m, 11 Sep. 1989 (fl), *R. B. Foster & H. Beltran 11371* (F, MO).

*Acknowledgments.* I thank J. A. Kallunki and A. Pool for bringing the type of *Galipea guatemalensis* to my attention; J. S. Miller and G. E. Schatz for useful discussions of geographic variability; and C. M. Taylor for a careful reading of the manuscript.

Literature Cited

Engler, A. 1931. Rutaceae. Nat. Pflanzenfam. ed. 2, 19a: 187–359.

Jiménez M., Q. & R. E. Gereau. 1991. *Peltostigma parviflorum* (Rutaceae), nueva especie de Costa Rica y Colombia. Ann. Missouri Bot. Gard. 78: 527–530.

Morton, C. V. 1933. A new species of *Peltostigma* from Mexico. Proc. Biol. Soc. Wash. 46: 83–84.

Standley, P. C. & J. A. Steyermark. 1946. Rutaceae. *In*: P. C. Standley & J. A. Steyermark, Flora of Guatemala, Fieldiana, Bot. 24(5): 389–425.

# *Triniochloa talpensis* (Poaceae: Pooideae), a New Species with Deciduous Leaves from Mexico

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ABSTRACT. *Triniochloa talpensis* from Mexico is described and illustrated. Its morphology and leaf anatomy are compared with those of *T. laxa* Hitchcock.

RESUMEN. Se describe e ilustra *Triniochloa talpensis* de México. Se comparan características de morfología y de anatomía foliar con aquellas de *T. laxa* Hitchcock.

*Triniochloa* is a small genus of grasses that was described by Hitchcock in 1913, the members of which grow in temperate forests from Mexico to Bolivia. It is distinguished from other genera of the Pooideae by its spikelets 1-flowered without a rachilla extension, floret callus obtuse and bearded, and lemma 5- or 7-nerved with a bifid apex and geniculate awn inserted above the middle. This genus was included in the tribe Meliceae of the subfamily Pooideae by Reeder (1968) on the basis of its connate leaf sheaths, membranous ligules, truncate lodicules that lack vascular traces, and small chromosomes. He suggested that it is closely related to *Schizachne*. This placement is supported by Clayton & Renvoize (1986) and Watson & Dallwitz (1992).

*Triniochloa*, as presently circumscribed, includes four species: *T. laxa* Hitchcock and *T. micrantha* (Scribner) Hitchcock, which are restricted to Mexico; *T. stipoides* (H.B.K.) Hitchcock, distributed from central Mexico to Colombia, Venezuela, and Bolivia; and *T. andina* Luces, known only from Venezuela. The new species from western Mexico increases the number to five.

Mature blades of basal leaves from herbarium specimens were used for anatomical studies. A segment about 10 mm long was removed from the middle of the blade, rehydrated by boiling in water, sectioned free-hand, and mounted in glycerin jelly. Epidermis preparations were made following Metcalfe's (1960) method. Drawings were made using an X-100-1 Ken-A-Vision Microprojector.

**Triniochloa talpensis** M. González-Ledesma & M. Gómez-Sánchez, sp. nov. TYPE: Mexico. Jalisco: Municipio de Talpa de Allende, alrededores de la mina Zimapán en la Sierra de Cuale, ca. 2150 m, 10 Feb. 1992, *M. González-Ledesma & J. A. Pérez de la Rosa 496* (holotype, CHAPA; isotypes, IBUG, MEXU, MICH, MO, US, XAL). Figure 1.

Plantae perennes, rhizomatosae. Culmi 60–110 cm alti. Vaginae foliorum pubescentes prope nodos. Ligulae 1.5–2.5(–5) mm longae. Laminae foliorum planae 22–27 cm longae et 3.0–5.0 mm latae inferioribus caducis. Panicula erecta, angusta, 16–34 cm longa, ex vagina exserta. Spiculae 11.0–16.8 mm longae. Glumae inaequales, prima spiculis breviore, 7.5–13.6 mm longa; secunda quam lemma aequanti vel longiore, 11.0–16.5 mm longa. Lemma 11.0–14.5 mm longum, 7-nerve, arista dorsali geniculata, 13.0–23.0 mm longa. Antherae (4.8–) 5.5–7.0 mm longae.

Perennial herbs with rhizomes to 20 cm long, 2–3 mm diam., rhizome sheaths strigose near the nodes. Culms 60–110 cm tall, 1.5–2.0 mm diam. near the base, robust, strongly decumbent, pubescent below the upper nodes. Leaves, at least the lower, ciliate near the collar. Leaf sheath margins connate, the upper sheaths shorter than the internodes and pubescent below. Ligules 1.5–2.5(–5) mm long, membranous. Blades 22–27 cm long, 3.0–5.0 mm wide, flat, deciduous at level of the collar or beneath, adaxial surface scabrous to pubescent, with prominent ribs, abaxial surface glabrous. Panicle 16–34 cm long, 1.0–2.0(–2.5) cm wide, erect, narrow, completely exserted, with 30–65(–90) spikelets; panicle axis glabrous below, scabrous on the angles toward the apex; lowest node 1–2-branched; branches appressed or ascending, scabrous at least toward the apex. Spikelets 11.0–16.8 mm long, 1-flowered. Glumes unequal, hyaline except near the nerves. First glume 7.5–13.6 mm long, shorter than the spikelet, 1-nerved. Second glume 11.0–16.5 mm long, as long as the spikelet, 3-nerved. Lemma 11.0–

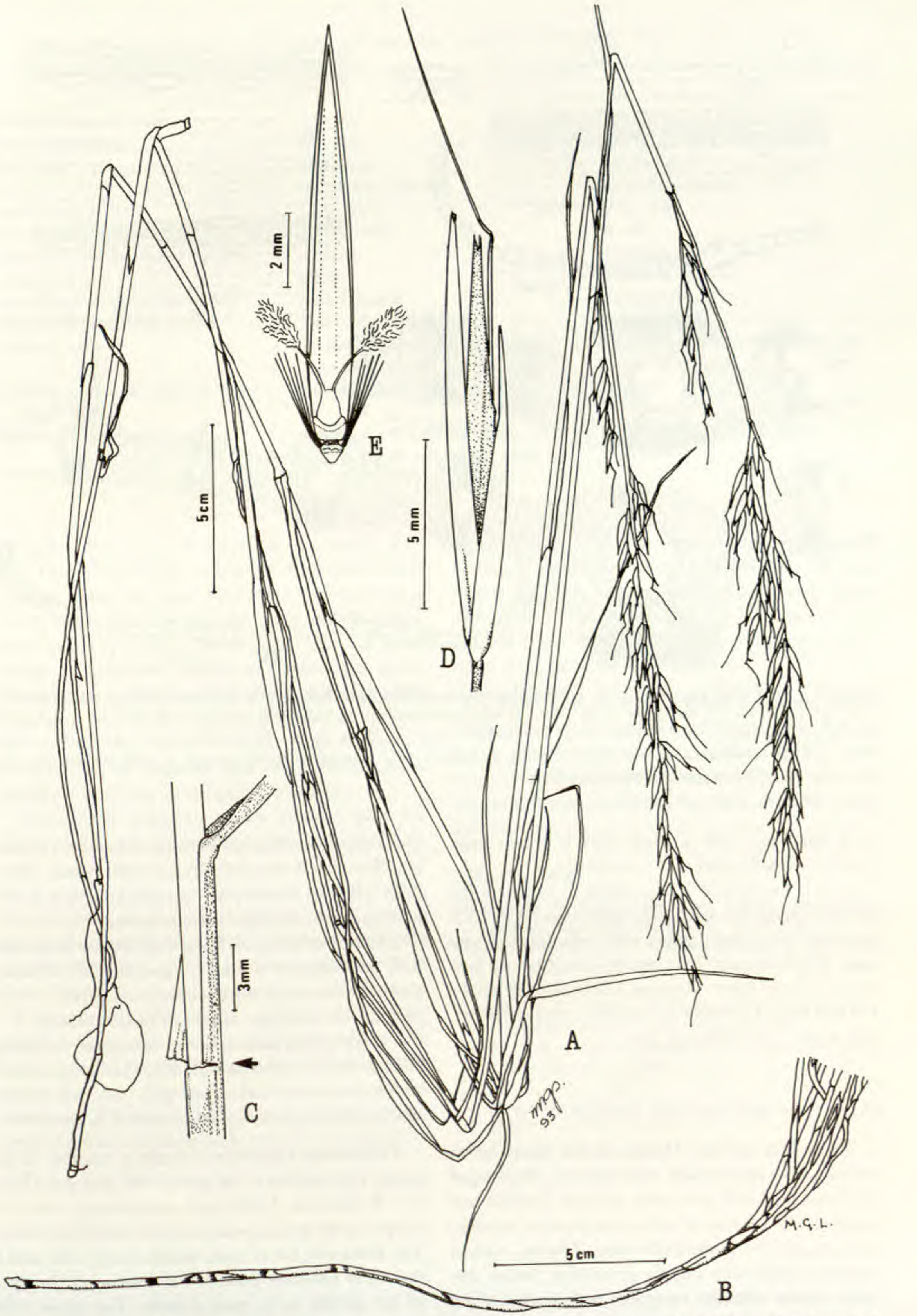


Figure 1. *Triniochloa talpensis* M. González-Ledesma & M. Gómez-Sánchez (*González-Ledesma & Pérez de la Rosa 496*, CHAPA). —A. Habit. —B. Rhizome. —C.Upper portion of leaf sheath (hairs omitted) showing line of detachment of upper sheath and blade (arrow). —D. Spikelet. —E. Floret with the lemma removed.

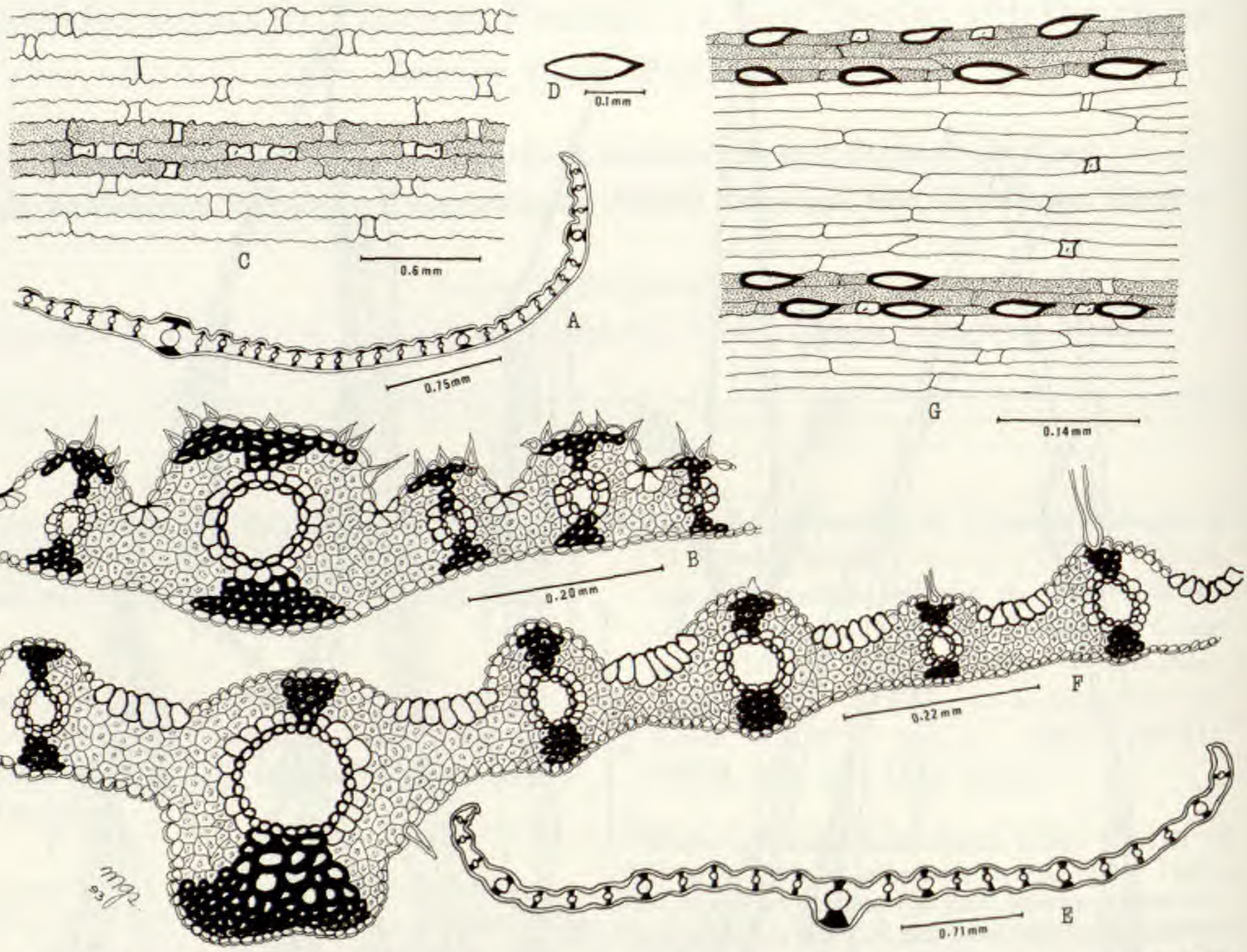


Figure 2. Leaf blade anatomy. A–D. *Triniochloa talpensis* (*González-Ledesma & Pérez de la Rosa 496*, CHAPA). —A. Outline of half of the blade. —B. Detail of transverse section, including the midrib. —C. Abaxial epidermis as seen in surface view. —D. Prickle. E–G. *Triniochloa laxa* (*T. Mejía-Saulés 1820*, CHAPA). —E. Outline of the blade. —F. Detail of transverse section, including the midrib. —G. Abaxial epidermis as seen in surface view. Stippling indicates the costal region in both C and G.

14.5 mm long, with a basal stipe 0.5 mm long, rounded dorsally, glabrous or scabrous at the apex, 7-nerved, the central 3 converging at or above the middle to form the awn; apex bifid; awn 13.0–23.0 mm long, geniculate; callus with hairs up to 5 mm long. Palea shorter than lemma. Rachilla not prolonged beyond floret. Stamens 3, anthers (4.8–)5.7–7.0 mm long. Lodicules 2, rounded, connate, short, and turgid. Caryopsis not seen.

LEAF BLADE ANATOMY (FIG. 2A–D)

*Transverse section*. Outline of the blade flat to involute. Adaxial surface with squared, flat-topped ribs associated with first-order vascular bundles and rounded ribs associated with second-order bundles; furrows narrow, moderately deep. Abaxial surface smooth, midrib only slightly projecting. Outer vascular bundle sheaths complete or interrupted by abaxial or adaxial sclerenchyma, round in outline. Sclerenchyma girders present, the adaxial T-shaped. Chlorenchyma nonradiate, its cells of various sizes and shapes, continuous between adjacent vascular bundles. Colorless parenchyma cells absent. Bulliform cells in fan-shaped, adaxial groups not projecting above the adjacent epidermis.

*Abaxial epidermis*. Long cells longer than wide with undulating anticlinal horizontal walls. Stomata absent. Intercostal short cells solitary, square or tall and narrow. Papillae absent. Prickles absent, or a few in the costal zone near the margin of the blade. Silica cells in costal zone with dumb-bell-shaped silica bodies, sometimes associated with cork cells. Costal short cells solitary or in pairs, seldom in short rows.

*Triniochloa talpensis* is clearly a member of the genus *Triniochloa* in its anatomical features (Watson & Dallwitz, 1992) and morphology, but it is unique in the genus because of its deciduous leaves. The basal and lower culm leaves simply die, and if the blade becomes detached it does so at the apex of the sheath, as in most grasses. The upper culm leaves have a special way of separating: when they are mature and dry, the blade and the portion of the sheath above the point of closure separate in

TABLE 1. Salient characters distinguishing *Triniochloa talpensis* and *T. laxa*.

| Character | *T. talpensis* | *T. laxa* |
|---|---|---|
| Rhizome diameter (mm) | 2.0–3.0 | 0.8–1.0 |
| Plant height (cm) | 60–110 | 40–80 |
| Leaf blade | deciduous | persistent |
| Panicle | completely exserted | partially exserted |
| Panicle length (cm) | 16.0–34.0 | 7.0–13.0 |
| Spikelets per panicle | 30–65(–90) | 6–18 |
| Adaxial ribs of first-order bundles | squared | rounded |
| Adaxial furrows | narrow | wide and shallow |
| Abaxial projection of the midrib | inconspicuous | conspicuous |
| Adaxial sclerenchyma girders | T-shaped | I-shaped |
| Bulliform cells | fan-shaped groups not projecting above the epidermis | rows projecting above the level of the epidermis |
| Anticlinal horizontal walls of long cells | undulating | straight |
| Prickles (abaxial epidermis) | absent or a few in the costal zone near the margin of the blade | abundant in all costal zones |

one piece from the remainder of the sheath (Fig. 1C). This is especially noticeable in pressed, dried material when the upper blades are moved in order to expose the ligule or when they are slightly pulled. Detachment is along a well-defined line, but there is no articulation nor evidence of an abscission layer. Detachment was not seen in fresh material when the plants were collected and pressed. It appears that an abscission layer develops when the plants are drying. This suggests that the phenomenon is possibly a response to drought conditions.

*Triniochloa talpensis* grows in open pine-oak forests and is only known from the Sierra de Cuale in the municipio of Talpa (whence the specific epithet), state of Jalisco, in the western part of the Eje Neovolcánico. It is closely related to *T. laxa*, a species that grows in forests of spruce and pine mixed with poplar, and is restricted to the northern Sierra Madre Occidental in the state of Chihuahua.

Although both species have rhizomes and similar spikelets, *Triniochloa talpensis* is more robust than *T. laxa*, and there are various other characters that distinguish them (Table 1). In addition, important anatomical differences were found in the arrangement of the adaxial sclerenchyma, the protrusion of the bulliform cells, the shape of adaxial ribs, the abundance and distribution of the prickles, and other features (Fig. 2, Table 1). Deciduous leaves, narrow adaxial leaf furrows, and more abundant adaxial prickles (Fig. 2B) suggest that *T. talpensis* is adapted to drier habitats than *T. laxa*.

*Acknowledgments*. We thank Fernando Chiang Cabrera for reviewing the Latin description. We also thank the curators of COL, ENCB, MEXU, MO, and US for lending specimens under their care, and the anonymous reviewers for their valuable observations.

Literature Cited

Clayton, W. D. & S. A. Renvoize. 1986. Genera Graminum. Kew Bull., Addit. Ser. 13: 1–389.

Hitchcock, A. S. 1913. Mexican grasses in the United States National Herbarium. Contr. U.S. Natl. Herb. 17(3): 181–389.

Metcalfe, C. R. 1960. Anatomy of Monocotyledons. I. Gramineae. Oxford Univ. Press, Oxford.

Reeder, J. R. 1968. Systematic position of the genus *Triniochloa* (Gramineae). Amer. J. Bot. 55: 735.

Watson, L. & M. J. Dallwitz. 1992. The Grass Genera of the World. C. A. B. International, Wallingford, U.K.

# *Didymocarpus miniatus* (Gesneriaceae), a New Species from Peninsular Malaysia

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ABSTRACT. *Didymocarpus miniatus* (Gesneriaceae), a new species in *Didymocarpus* sect. *Heteroboea*, is described from Bukit Bauk in Trengganu, Peninsular Malaysia.

**Didymocarpus miniatus** Kiew, sp. nov. TYPE: Peninsular Malaysia. Trengganu: Bukit Bauk, *R. Kiew RK 3792* (holotype, UPM; isotypes, L, SING).

Differt a *Didymocarpo atrosanguineo* Ridley foliis petiolatis, pedunculis brevioribus et floribus omnino miniatis.

Herb. Stem woody, up to 1 m tall and 0.7 cm thick. Indumentum of young stem, petioles, and lower surface of veins silky ferrugineous with uniseriate 3–4-celled trichomes ca. 1.5 mm long. Leaves petiolate, spirally arranged on the upper 4–12 cm of stem, separated by internodes up to 2 cm long. Lamina oblanceolate, (15–)17–24 × (5.5–)6–10 cm, apex acuminate, acumen 1–2 cm long, strongly narrowed to base, drying chartaceous, margin crenate, indumentum of 2-celled uniseriate hairs ca. 0.5 mm long, dense and roughly velvety above, less dense beneath, in life dark green above and pale grayish green beneath. Midrib prominent above and beneath, secondary veins 20–21 pairs, plane above and prominent beneath, tertiary veins obscure above, prominent beneath, areoles near the midrib irregular in shape, those toward the margin rectangular. Petiole (1.5–)2(–3) cm long. Flowers solitary. Peduncle slender, 6–12 mm long. Bract pairs ligulate, 3 mm long, finely hairy. Calyx divided to base, lobes linear, 4 mm long, densely hairy. Corolla completely vermilion with two yellow longitudinal nectar guides in the base of the throat, finely pubescent outside, hairs glandular uniseriate, 2–3-celled stalk up to 0.5 mm long, nectar guides with scattered minute ellipsoid vesicles, tube 2.5–3.7 cm long, narrow, 3–4 mm wide in the lower half, dilating distally to 10 mm wide, lobes 5, broadly rounded, upper two 4 × 7 mm, lower three 8 × 6 mm and projecting beyond the upper two. Stamens 2, filament slender, 10 mm long, anthers white, oblong, 2 × 1 mm, connivent, positioned within corolla tube. Ovary 5 × 0.5 mm, style slender, 30 mm long, densely pubescent with glandular hairs, stigma discoid, peltate, 1 mm across. Nectary encircling base of ovary, 0.75 mm high, distally lobed for ca. one-third of its length. Capsule slender, 7.5–8 cm long, finely pubescent when young.

Among the 85-odd *Didymocarpus* species in Peninsular Malaysia, only *D. miniatus* has completely vermilion flowers. Only one other species, *D. atrosanguineus*, has flowers with red lobes, but its corolla tube is usually cream-colored. (One or two plants of this latter species in Sekayu Forest Reserve, Trengganu, produce flowers that are completely red, but they are deep crimson not vermilion.) In lamina indumentum, *D. miniatus* most closely resembles the broad-leaved form of *D. atrosanguineus* (Kiew, 1989), but it is readily distinguished from this form by its petiolate leaves.

*Didymocarpus miniatus* belongs to section *Heteroboea*, which includes species with large, trumpet-shaped, solitary flowers and large oblanceolate leaves (Ridley, 1923). However, it is atypical of this section, in which the species have leaves with a winged petiole, by its petiolate leaves. In addition, *D. miniatus* is distinct in its short peduncles, 0.6–1.2 cm long, as opposed to peduncles 2.5–10 cm long in other species in this section.

In common with other large tubular *Didymocarpus* flowers (Kiew, 1992), the stigma in *D. miniatus* is discoid and peltate, and the nectary is large and cylindrical (although it is the first species in section *Heteroboea* to be described with a lobed nectary). The glandular indumentum on the style resembles that of *D. quinquevulnerus* Ridley, which is also a member of section *Heteroboea*.

*Didymocarpus miniatus* has an extremely local distribution, at the foot of Bukit Bauk, where it grows on slopes above small swampy areas or seasonal streams, and at about 20 km south on Bukit Chabang, 5 km inland of Kerteh (G. W. H. Davison, pers. comm.). Both of these hills belong to the same coastal sandstone formation.

*Paratypes.* PENINSULAR MALAYSIA. Bukit Bauk, *S. Anthony SA 602* (UPM), *G. W. H. Davison GD5* (UPM), *K. M. Kochumen KEP 9491* (KEP).

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Literature Cited

Kiew, R. 1989. *Didymocarpus* (Gesneriaceae) on Gunung Tahan, Malaysia. Gard. Bull. Singapore 42: 47–64.

———. 1992. Five new species of *Didymocarpus* (Gesneriaceae) from Peninsular Malaysia. Gard. Bull. Singapore 44: 23–42.

Ridley, H. N. 1923. *Didymocarpus*. Flora Malay Peninsula. 2: 506–523. Reeve, London.

# A New Species of *Campyloneurum* (Polypodiaceae) from Northwestern Ecuador

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ABSTRACT. *Campyloneurum oellgaardii* is newly described from a humid western premontane Andean forest of Ecuador. It appears to belong to the *sphenodes* group, which is characterized by undivided primary areoles and long petiolate leaves, and which includes *C. coarctatum*, *C. inflatum*, *C. sphenodes*, and *C. sublucidum*.

During a study of the fern genus *Campyloneurum* C. Presl, a distinctive new species was recognized and is described below.

**Campyloneurum oellgaardii** B. León, sp. nov. TYPE: Ecuador. Carchi: drainage of Cerro Golondrinas mountains, 0°52′N, 78°07′W, 21 Dec. 1987, *Hoover 2211* (holotype, MO; isotype, QCA). Figure 1.

Species *C. inflato* proxima, a qua rhizomate longe repenti, 6 mm crasso, atrofusco, dense paleaceo, squamis adpressis, brunneolis, foliis ampliori lanceolatis, 147 cm longis, 22 cm latis differt.

Epiphyte; stem long-creeping, black, not pruinose, 6 mm wide. Stem scales lax, light brown in mass, ovate, 3–4 mm long, 2–2.5 mm wide, bases auriculate, apices obtuse, margins entire with scattered hairs, slightly clathrate, the cells oblong or broadly oblong, cell walls 6–9 μm wide, several central cells with dark brown walls, walls of marginal cells yellowish or brownish, cell lumina transparent. Phyllopodia 4–5 mm long, 7–10 mm wide, 1–15 cm distant. Leaves pendulous (?), 147 cm long, petiole 55 cm long, shiny dark stramineous; laminas lanceolate, 22 cm wide, herbaceous-chartaceous, base cuneate, apex long-acuminate, margins cartilaginous, sinuate, leaves with inconspicuous bicellular glandular hairs scattered abaxially; stomata polocytic or rarely copolocytic; costa prominent, slightly angular abaxially; primary veins prominent, 75° divergent from the costa, straight, lighter in color than the adjacent tissue, 7–9 mm distant; secondary veins slightly prominulous on both sides of the lamina, transverse secondary veins forming 19–21 primary areoles between the costa and margin; primary areoles undivided, with 2(–3) excurrent free veinlets, the marginal ones sometimes divided with (0)–1 veinlet. Sori subapical on the excurrent veinlet; paraphyses and spores not seen.

*Campyloneurum oellgaardii* is known only from the type material, collected in northwestern Ecuador, at 1200 m elevation in a perhumid premontane forest. This locality borders on what Dodson & Gentry (1991) considered an extension of the Chocó pluvial forest. The specimen was found growing as an epiphyte several meters above the ground. Based on the curvature of the petiole (Fig. 1a), the leaves are probably pendently arched.

*Campyloneurum oellgaardii* is characterized by well-spaced and extraordinarily large leaves, more than 1 m long, in addition to its undivided primary non-costal areoles. Because of its habit, leaf morphology, and pattern of venation this species fits within the *sphenodes* group of León (1992). Besides this new species, the *sphenodes* group consists of *C. chrysopodum* (Klotzsch) Fée, *C. coarctatum* (Kunze) Fée, *C. falcoideum* (Kuhn ex Hieronymus) M. Meyer ex Lellinger, *C. inflatum* M. Meyer ex Lellinger, *C. sphenodes* (Kunze ex Klotzsch) Fée, and *C. sublucidum* (Christ) Ching. *Campyloneurum oellgaardii* differs from the other species of the group in having a larger stem diameter (6 mm vs. 2–3 mm), obtuse stem scales, and longer (more than 100 cm vs. (17–)30–70(–85) cm) and broader (20 cm vs. (2–)3–6(–10) cm) leaves.

Most species of *Campyloneurum* have leaves less than 1 m long. Leaves longer than this are otherwise found only in: (1) those species with entire leaves, short-creeping stems and *phyllitidis*-, *brevifolium*-venation (*phyllitidis*-, *latum*-venation of Lellinger, 1988) such as *C. abruptum* (Lindman) B. León, *C.*

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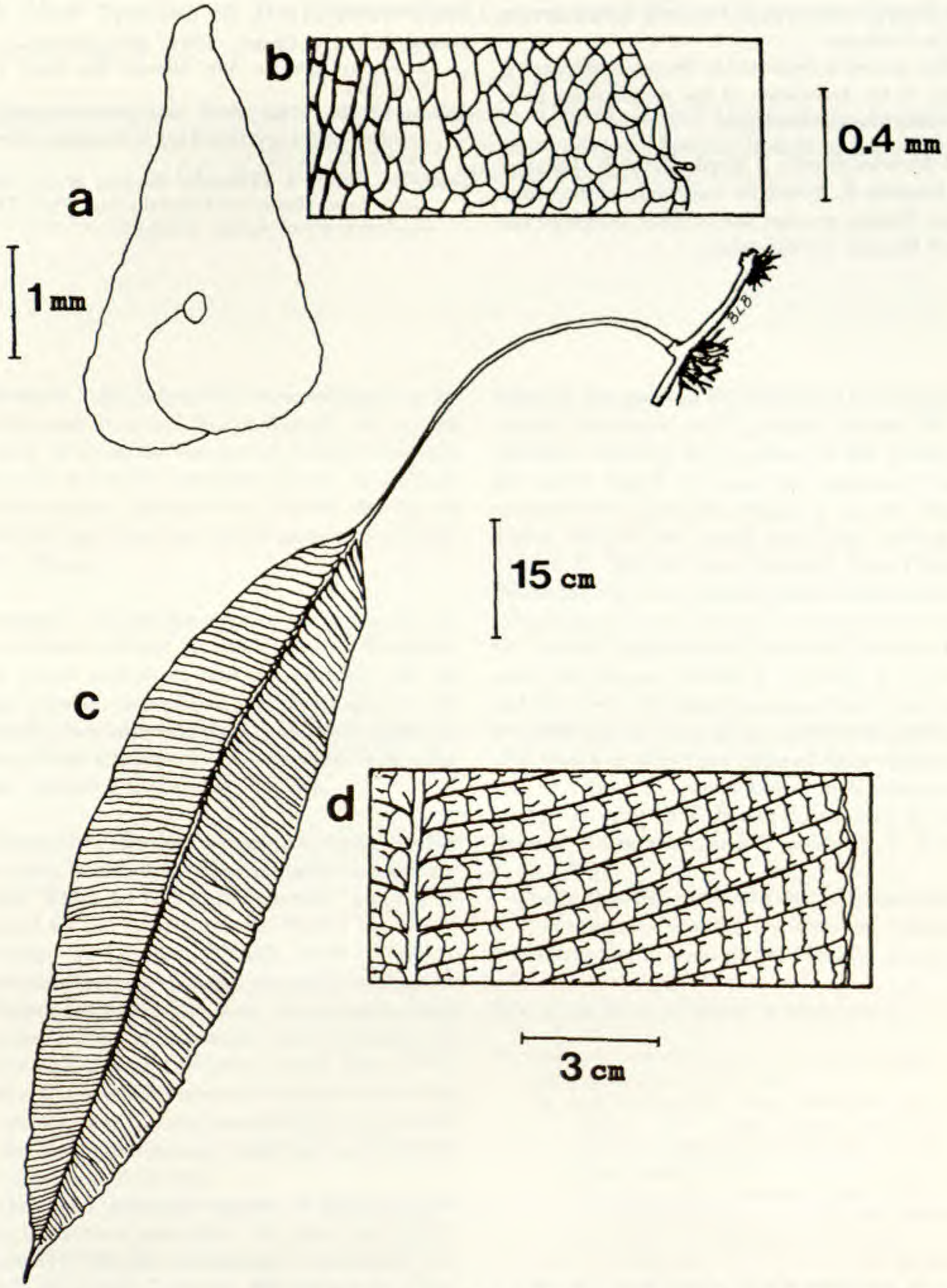


Figure 1. *Campyloneurum oellgaardii* B. León (from *Hoover 2211*). —a. Stem scale. —b. Cellular detail of stem scale. —c. Habit. —d. Pattern of venation. (Drawn by the author.)

*brevifolium* (Link) Link, *C. pascoense* R. M. Tryon & A. F. Tryon, *C. phyllitidis* (L.) C. Presl, and *C. tucumanense* (Hieronymus) Ching; and in (2) those pinnate-leaved species with undivided primary areoles, such as *C. decurrens* (Raddi) C. Presl and *C. magnificum* T. Moore. All these species are low epiphytes, epipetrics, or terrestrials, and they usually grow in partially closed forests. In contrast, *C. oellgaardii* is a high-canopy epiphyte, according to the collector, and its gigantism may be an adaptation

to a dense canopy and/or low risk of leaf damage due to breakage.

This species is dedicated to Benjamin Øllgaard in honor of his knowledge of the Ecuadorean flora, especially the pteridophytes.

*Acknowledgments.* I thank David B. Lellinger and Kenneth R. Young for comments on the manuscript. Thanks are also due to Alice Tangerini and David Brunner for assistance.

Literature Cited

Dodson, C. & A. H. Gentry. 1991. Biological extinction in western Ecuador. Ann. Missouri Bot. Gard. 78: 273–295.

Lellinger, D. B. 1988. Some new species of *Campyloneurum* and a provisional key to the genus. Amer. Fern J. 78: 14–35.

León, B. 1992. A Taxonomic Revision of the Fern Genus *Campyloneurum* (Polypodiaceae). Ph.D. Thesis, University of Aarhus, Denmark.

# A New Species of *Beilschmiedia* (Lauraceae) from Guerrero, Mexico

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ABSTRACT. *Beilschmiedia angustielliptica* is described and illustrated. Morphologically this species is easy to recognize because of its long, reticulate (but not foveolate) lanceolate leaves, its glabrous anthers, and its glabrate ovary. So far, this species is known only from the central mountains of Guerrero, Mexico.

RESUMEN. Se describe e ilustra *Beilschmiedia angustielliptica*. Entre las otras especies del género esta nueva especie es fácil de reconocer por sus hojas grandes, lanceoladas, reticuladas (pero no foveoladas), sus anteras glabras, y su ovario glabrado. Hasta ahora esta especie sólo se conoce de las montañas centrales de Guerrero, México.

Extensive collections carried out during the last ten years in Guerrero, Mexico, under the auspices of the "Flora del Estado de Guerrero" project, organized by the Laboratorio de Plantas Vasculares (Facultad de Ciencias, UNAM), have resulted in more complete collections for several formerly poorly known families in that state. For example, about a dozen species of Lauraceae were previously reported from Guerrero (Standley, 1922; Allen, 1945). Today, the assembled material represents more than 35 species. Several collections belong to undescribed species in different genera. A new species of *Beilschmiedia* is here described.

The Latin American species of *Beilschmiedia* were last revised more than 50 years ago by Kostermans (1938), who recognized 15 neotropical species in the genus. Currently, the increase in collections suggests the merger of some names, but also the recognition of new species, so the actual number of taxa is around 10–20 species (van der Werff, 1991).

In Mexico there exist about eight species of *Beilschmiedia*. For a time, only *B. mexicana* (Mez) Kostermans was recognized as occurring in the country (Kostermans, 1938; Allen, 1945). Several Mexican specimens of *Beilschmiedia* have been annotated in herbaria as *B. pendula* (Swartz) W. B. Hemsley, implying the presence of this species in the region. But *B. mexicana* is suspected to be a synonym of *B. pendula* (Burger & van der Werff, 1990). Early in the second half of this century *B. riparia* F. Miranda was described from Chiapas (Miranda, 1953) as a distinct species with pilose and subcoriaceous leaves; this species is now known from the tropical semideciduous forests in Guerrero, Oaxaca, and Chiapas. Besides *B. pendula*, *B. riparia*, and the newly described species, several collections from different places in Mexico indicate the presence of at least five other taxa, some of them conspecific with or related to species known in Mesoamerica, namely: *B. anay* (S. F. Blake) Kostermans, *B. hondurensis* Kostermans, and *B. ovalis* (S. F. Blake) C. K. Allen.

Until a thorough revision of the American species of *Beilschmiedia* is done, I present the following provisional key to separate the Mexican species.

KEY TO THE MEXICAN SPECIES OF *BEILSCHMIEDIA*

1a. Leaf undersurface glabrous, rarely some straight appressed hairs on main veins.
  2a. Leaf undersurface finely reticulate (cancellate), minor veins evenly thickened forming areolae 0.1–0.3 mm diam., no or almost no free veinlets.
    3a. Leaves stiff coriaceous, rather thick, obtuse to acute ..... *B.* aff. *mexicana*
    3b. Leaves chartaceous, acute to long acuminate ..... *B. mexicana*
  2b. Leaf undersurface roughly reticulate, minor veins unevenly thickened, then areolae usually 1.0 mm diam. or larger and appearing with several free veinlets.
    4a. Secondary veins in 14–18 pairs, leaves narrowly elliptic ..... *B. angustielliptica*
    4b. Secondary veins in 8–10 pairs, leaves elliptic ..... *B. hondurensis*
1b. Leaf undersurface pubescent, if hairs only on main veins, these not straight appressed.

Figure 1. *Beilschmiedia angustielliptica* Lorea-Hernández. —A. Branchlet with inflorescence. —B. Branchlet with fruit. —C. Detail of inflorescence last divisions. —D. Open flower (ovary removed). —E. Lateral and abaxial views of a third whorl stamen. —F. Staminode. —G. Ovary. —H. Adaxial and lateral views of an external stamen.

5a. Hairs on undersurface straight and appressed ..... *B.* aff. *pendula*
5b. Hairs on undersurface straight to curly, erect or loosely appressed.
6a. Hairs curly, erect to loosely appressed ..... *B. ovalis*
6b. Hairs straight and erect.
7a. Leaf blades widely elliptic to oblanceolate; widest leaves 11–14 cm ..... *B.* aff. *anay*
7b. Leaf blades elliptic, widest leaves 5–8.5 cm ..... *B. riparia*

**Beilschmiedia angustielliptica** Lorea-Hernández, sp. nov. TYPE: Mexico. Guerrero: Mpo. Atoyac de Alvarez, aprox. 2 km S to El Molote, on the trail to El Edén, 1580 m, 19 May 1993 (fl, fr), *F. Lorea & L. Lozada 5540* (holotype, FCME; isotype, MO). Figure 1.

Arbores parvae (7–8 m altae). Folia opposita vel subopposita, lamina (7–)11–18(–24.5) × (1.5–)2.5–4.5(–5.5) cm, anguste elliptica, aliquantum oblanceolata, basi apiceque acuta vel acuminata, utrinque glabra, margine interdum leviter undulata, nervis lateralibus subtus prominentibus, costa supra complanata, subtus valde prominenti ac in sicco manifeste rubiginosa. Inflorescentiae 2.5–5.5(–9.5) × 1.5–3 cm, paniculatae, axillares in ramulos aphyllos breves crebiter positae, vel terminales; axibus puberulis vel tomentosis. Flores hermaphroditi, 2.2–2.7 mm longi, tepalis sex, ovatis vel late ovatis, erectis, abaxialiter pro parte maxima puberulis, adaxialiter praecipue basi puberulis, margine glabris; staminibus novem, 1.1–1.4 mm longis, antheris glabris, eis verticillorum primi et secundi complanatis, late ovatis, eis verticilli tertii pyramidalibus, filamentis omnino pilosis vel tomentosis; staminodiis fere sessilibus, apice triangularibus, basi truncatis vel subcordatis, ovario 0.7–0.85 mm longo, pyriformi, glabrato; hypanthio tomentoso. Fructus 3–3.5 × ca. 1.7 cm, ellipticus, anthracinus.

Low trees (7–8 m), young branches compressed to flattened, yellow-golden puberulent to tomentose, bark reddish brown, glabrous and light brown with rather smooth bark when older, buds densely tomentose. Leaves opposite, a few subopposite, petioles (0.5–)0.7–1.3(–1.8) cm, slightly canaliculate, puberulent, soon glabrous, blades (7–)11–18(–24.5) × (1.5–)2.5–4.5(–5.5) cm, narrowly elliptic, some oblanceolate, base and apex acute or acuminate, chartaceous, glabrous on both surfaces, sparsely puberulous when young, margin sometimes slightly undulate, veins on upper and lower surface slighty elevated, secondaries in 14–18 pairs, ascending, prominent on lower surface, midvein flattened on upper surface, very prominent and distinctly reddish brown when dry on lower surface. Inflorescences 2.5–5.5(–9.5) × 1.5–3 cm, axillary, close to each other on short aphyllous branchlets, or terminal, paniculate, pedunculate, peduncle 0.6–2.5(–4.5) cm, major axes 2.5–5.5 mm, puberulent to tomentose, flower pedicels (2–)2.6–3.6(–4.2) mm, puberulent, bibracteolate close to the base or not, bracteoles minute and soon falling. Flowers hermaphroditic, 2.2–2.7 mm long, tepals six, 1.5–1.7 × 1–1.3 mm, ovate to widely ovate, erect, outside puberulent for most of the central area, inside mainly on the base, margins glabrous, stamens nine, 1.1–1.4 mm long, anthers of first and second whorls 0.7–0.8 mm long, flattened, widely ovate, thecae introrse, anthers of third whorl 0.5–0.6 mm long, pyramidal, thecae extrorse-lateral, all filaments pilose to tomentose, anthers glabrous, connectives protruding beyond the anther cells, apparently glandular, glabrous, glands irregularly round, 0.4–0.5 mm, staminodes 0.4–0.6 mm long, almost sessile, apex triangular, acute, base truncate or subcordate, adaxial face plane, abaxial face convex and tomentose in the middle, ovary 0.7–0.85 mm long, pyriform, glabrate, style 0.4–0.5 mm long, stigma apical, oblique, hypanthium 0.5–0.8 mm, tomentose. Fruit 3–3.5 × 1.7 cm, when mature, elliptic, black, smooth, and shiny.

*Beilschmiedia angustielliptica* is well distinguished morphologically from other species in America by its narrow, elliptic leaves conspicuously reticulate (but not foveolate), and glabrous anthers. The general appearance of leaf reticulation in *B. hondurensis* suggests some similarity with *B. angustielliptica*, but the former has more or less abruptly acuminate, short elliptic leaves and the ovary is glabrous, whereas in *B. angustielliptica* the leaves are long lanceolate and the ovary is sparsely pilose. So far, *B. angustielliptica* is known only from mesophyllous mountain forests in Guerrero, where the canopy is dominated by *Quercus* spp., *Magnolia schiedeana* D. F. L. v. Schlechtendal, *Pinus strobus* L. var. *chiapensis* M. Martínez, *Persea americana* P. Miller, *Licaria* aff. *triandra* (Swartz) Kostermans, *Alchornea latifolia* Swartz, *Cinnamomum* sp., *Prunus* sp., and *Pouteria* sp.

*Paratypes.* MEXICO. **Guerrero:** Mpo. Atoyac, El Molote, 1630 m, (fr), *A. Núñez 1159* (FCME); Mpo. Tecpan, km 16 on the road from El Porvenir to San Antonio de Las Tejas, 1360 m, 7 m tree, (fl), *G. Lozano 227* (FCME).

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Literature Cited

Allen, C. K. 1945. Studies in the Lauraceae. VI. Preliminary survey of the Mexican and Central American species. J. Arnold Arbor. 26: 280–434.

Burger, W. C. & H. van der Werff. 1990. Lauraceae. *In:* W. Burger (editor), Flora Costaricencis. Fieldiana, Bot. n.s. 23: 1–138.

Kostermans, A. J. G. H. 1938. Revision of the Lauraceae V. Recueil Trav. Bot. Néerl. 35: 834–931.

Miranda, F. 1953. Plantas nuevas o notables de la flora de Chiapas. Anales Inst. Biol. Univ. Nac. México 24: 69–96.

Standley, P. C. 1922. Lauraceae. *In:* Trees and shrubs of Mexico. Contr. U.S. Natl. Herb. 23(2): 286–298.

Werff, H. van der. 1991. A key to the genera of Lauraceae in the New World. Ann. Missouri Bot. Gard. 78: 377–387.

# *Passiflora sanctae-mariae* in Series *Luteae* (Passifloraceae), a New Species and Series in Subgenus *Decaloba*

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ABSTRACT. *Passiflora sanctae-mariae*, restricted to Chiapas, Mexico, and adjacent Guatemala, is newly described and assigned to a species group that includes *P. lutea* L. of the United States. The five species of this group lack extrafloral nectaries and have very reduced or no bracts. The group is recognized as *Passiflora* series *Luteae* (Small) J. MacDougal, comb. et stat. nov.

*Passiflora sanctae-mariae* is a new species of small vining passionflower, known from nine dried collections and one living collection. The living collection, field collected by the author, was grown and observed in the greenhouse for several years, and it furnished the type collection. The species is restricted to the volcanic mountains of northwestern Guatemala and adjacent Chiapas, Mexico. It is closely related to *P. lutea* L. of the United States, the Mexican and Guatemalan *P. pavonis* Masters, an as yet undescribed species in east-central Mexico (*Passiflora dictamo* sensu Killip, not DC.), and *P. filipes* Bentham, which ranges from Texas to Ecuador. These five species lack extrafloral nectaries and have very reduced or no bracts, and form a related species alliance here recognized as a series.

**Passiflora** series **Luteae** (Small) J. MacDougal, comb. et stat. nov. *Passiflora* [no rank] *Luteae* Small, Man. S. E. Fl. 895. 1933. TYPE: *Passiflora lutea* L.

Small (1933), in his flora of the southeastern United States, subdivided the seven species of *Passiflora* listed there into four categories, one of which he named *Luteae*. It contained *P. lutea* and *P. sexflora* A. L. Jussieu. This infrageneric unit was published without rank, among the many such keying categories used throughout that work. Small's name is valid under Article 35.2 of the *Code* and serves as the basionym for the name of the series. Killip, in his taxonomic monograph of 1938, placed *P. lutea* and *P. sexflora* in subgenus *Plectostemma* Masters but separated the species into their own separate series under section *Decaloba* (DC.) Masters. He correctly associated *P. pavonis* and *P. filipes* with *P. lutea*. Killip made no reference to Small's work, even in the bibliography of the monograph, and appears to have independently used the name *Luteae*. Killip's "series" are invalidly published, however, as they lack Latin diagnoses, and the name is now validated as a series here. The series is most easily recognized within subgenus *Decaloba* by the absence of extrafloral nectaries, extreme reduction or absence of floral bracts, and the small purple berry. Further characteristics include small flowers with the coronal filaments in two series, the outer series filiform, greenish white to greenish yellow or pale yellow, and sometimes dull purplish or dull violet at base. The ovaries are glabrous or with few short hairs. The *Passiflora bilobata* A. L. Jussieu complex of the West Indies appears to be the sister group to series *Luteae* based on floral morphology and lack of extrafloral nectaries.

The delineation and lectotypification of subgenus *Plectostemma* and the earlier and generally overlooked subgenus *Decaloba* (DC.) Reichenbach is nearly the same (see discussion in MacDougal, 1994), so the series and following new species are here placed in subgenus *Decaloba* section *Decaloba*.

**Passiflora sanctae-mariae** J. MacDougal, sp. nov. TYPE: Cultivated at Duke University, June 1982, from stems of *MacDougal & Miley 602* collected Jan. 1980 in Guatemala, *MacDougal & Miley 602GR* (holotype, DUKE; isotypes, BM, CAS, CR, EAP, HUA, MEXU, MO, USCG, US). Figures 1, 2b.

*Passiflora* scandens; petioli eglandulosi; folia eglandulosa bilobata vel trilobata, lobis lateralibus acutis, marginibus integris, lobo centrali obtuso vel obsoleto, vel truncata; bracteae nullae; coronae filamenta biseriata, filamentis exterioribus filiformis, 2.1–3.0 mm longis; operculum plicatum; ovarium glabrum; bacca atropurpurea; semina 10–13 sulcata.

Slender perennial vine 2–5 m long, minutely puberulent throughout at the shoot tip with trichomes (0.05–)0.08–0.2(–0.3) mm long, except the adaxial surface of the lamina glabrous (or a few trichomes at the base of the primary veins), older growth sparsely puberulent to glabrescent. Stems terete, tardily glabrescent, drying subangulate and striate,

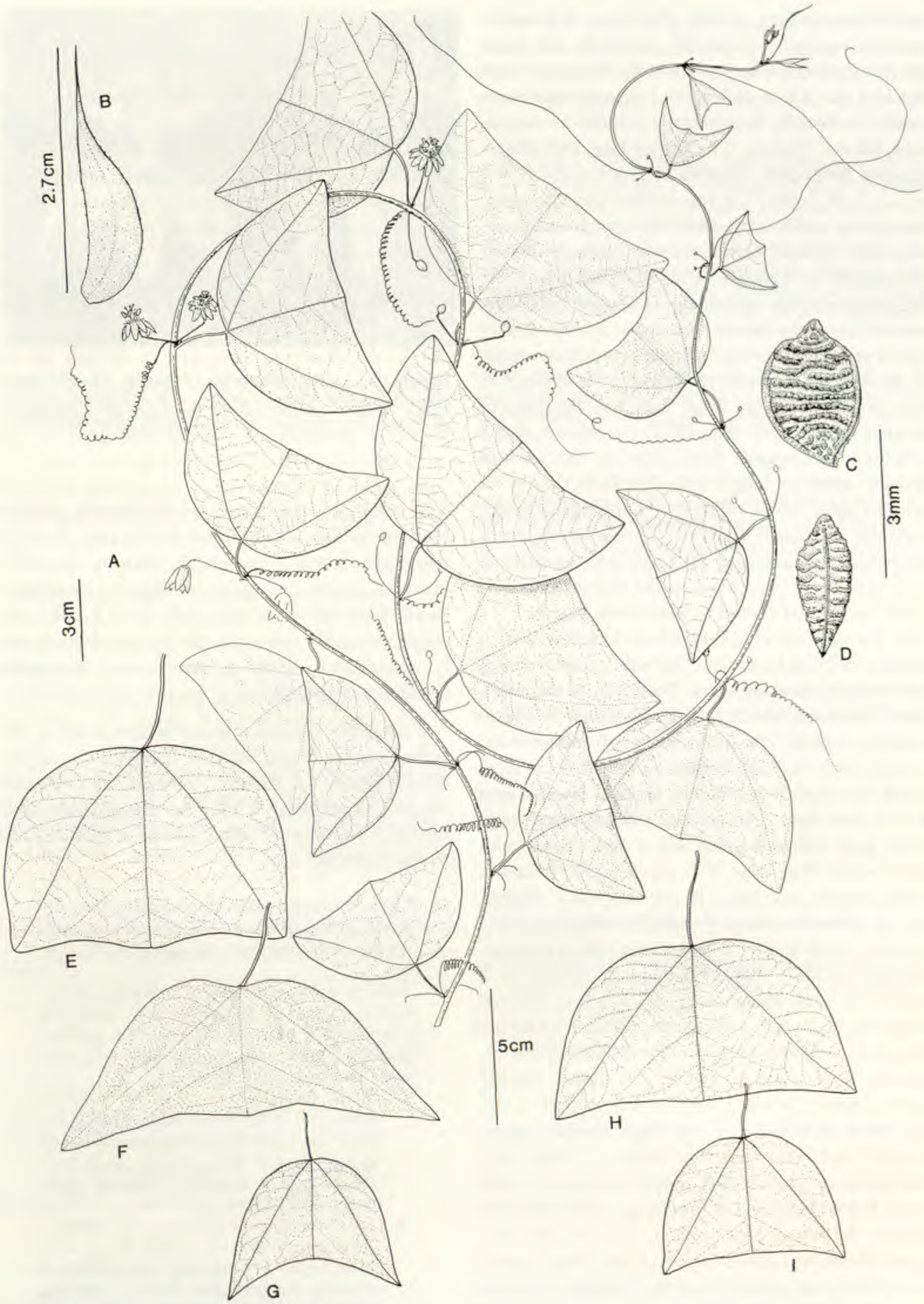


Figure 1. *Passiflora sanctae-mariae* J. MacDougal (from *MacDougal & Miley 602GR*, except as noted). —A. Habit. —B. Stipule. —C, D. Seed. —E–G. Leaves at prereproductive nodes; F (*Steyermark 37098*), G (*Steyermark 37215*). —H, I. Leaves at flowering nodes; H (*Breedlove 50768*), I (*Purpus 7292*).

with little secondary growth; phyllotaxy 2/5; nodes sometimes purplish (especially prophylls and junction of stipules); posture of shoot tip cernuous. Stipules (1.1–)2–3.5 × 0.3–0.5(–1.0) mm, linear-lanceolate to broadly lanceolate, attenuate to acuminate, falcate. Petioles 1.1–2.6 cm long, eglandular, minutely puberulent. Laminas at fertile nodes (2.5–)4–7.3 × (4.7–)6–11.2 cm, entire, not variegated, the general outline depressed obovate, truncate-oblate, semi-circular, or transversely truncate-elliptic, subtruncate to shallowly 2(–3)-lobed less than 0.15 the distance to the very shallowly cordate to broadly rounded base, the lateral lobes acute (rarely slightly obtuse or somewhat rounded), the central lobe obtuse to obsolete, lobes not mucronulate or the mucro 0.5 mm long or less, the angle between the primary lateral veins (62–)67–90(–112)°, the ratio of central to lateral vein lengths 1.1–1.5(–1.7), the ratio of laminar width to length 1.2–2.0(–2.3); leaves of juvenile plants often variegated along lateral veins, narrowly depressed obovate to transversely truncate-elliptic in outline, 2(–3)-lobed to ⅓ the distance to the base, the angle between the lateral veins 60–130°, the ratio of central to lateral vein lengths 1.3–2.1, the ratio of laminar width to length 1.2–3.6; laminar nectaries absent. Tendrils straight during development at shoot apex. Prophylls of the vegetative ramifying bud 2, broadly lanceolate to ovate, usually purplish, long acuminate or 3-toothed with central tooth caudate. Peduncles 1.1–2.6 cm long, geminate, uniflorous. Bracts absent. Hypanthium 4.5–5 mm diam., flowers ca. 1.5 cm diam., suberect, pale yellowish green with a dark center, with faint sweet odor; stipe 3–6 mm long (to 8 mm in fruit); sepals 7.5–10.5 × 2.8–4.2 mm, elliptic-oblong to ovate-oblong, rounded to subacute, ecorniculate; petals 5–8 × 2.4–2.6 mm, oblong to ovate-oblong, rounded, whitish; filamentous corona in 2 series, the outer filaments ca. 37–40, 2.1–3.0 mm long, ca. 0.2–0.3 mm diam., filiform, curved-spreading, slightly thicker in the distal half but attenuate at the very apex, cream to whitish, basally light greenish and often with a small purplish mark, the inner filaments 1.5 mm long, clavate, erect, purplish with pale apex; operculum 1.5 mm long, membranous, plicate, dark purple; nectary not concave; limen (disk) ca. 2.0 mm diam., uniformly dark purple, the raised edge only ca. 0.2 mm high; staminal filaments connate 3.1–4.1 mm along androgynophore, unmarked except dark purple at junction with limen, the free portions ca. 3–3.5 mm long, unmarked; anthers 2.8–3.1 mm long, not marked with purple; ovary 1.5–1.9 × 1.2–1.5 mm, widely ellipsoid, glabrous, light green; styles ca. 3–3.5 mm long; stigmas ca. 0.8 mm diam., cream. Fruit 1.1–1.4 × 0.9–1.1 cm, widely ovoid-ellipsoid, purplish black, estipitate; seeds 3.0–3.3 mm long, 2.0–2.3 mm wide, 1.2–1.3 mm thick, obovate to widely obovate, nearly symmetric to slightly campylotropous, transversely sulcate with 10–13 sulci, the ridges somewhat verrucose, the chalazal beak broadly conical and slightly inclined toward the raphe. Germination epigeal.

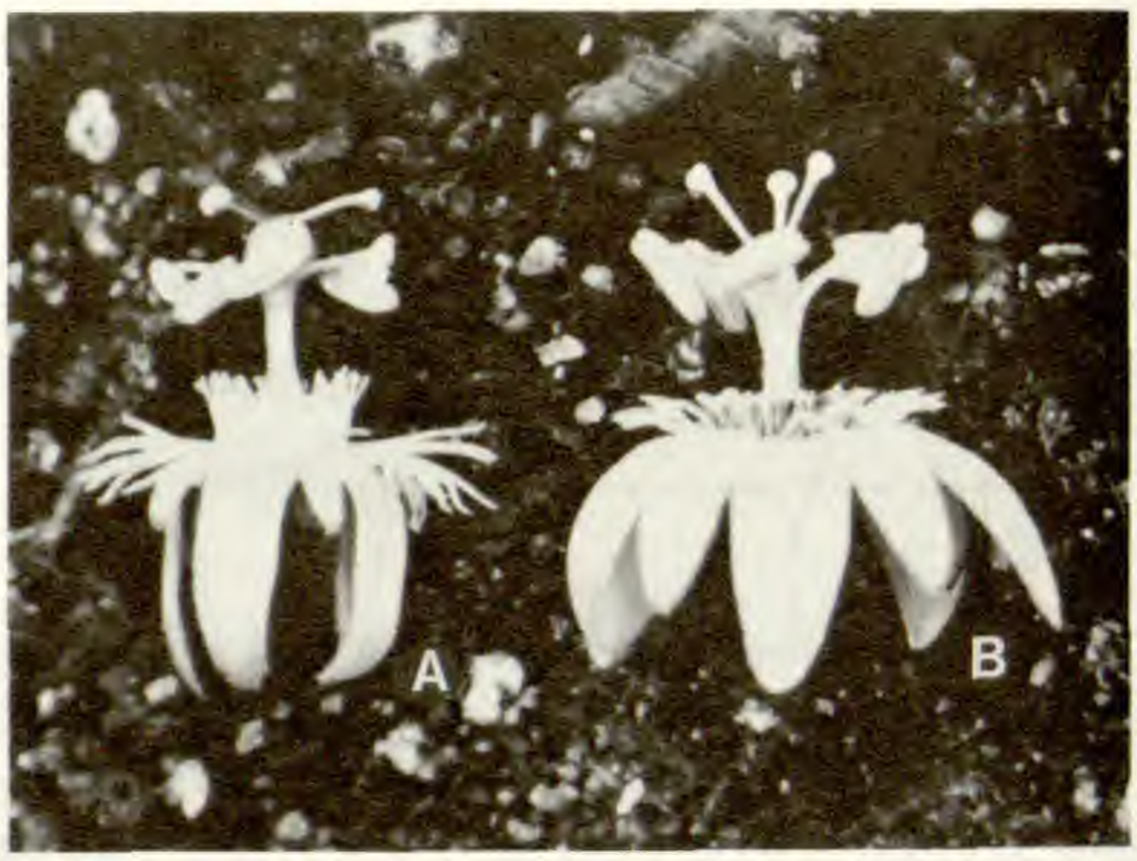


Figure 2. —A. Silhouette of flower of *P. filipes* (*MacDougal & Miley 579GR*). —B. Silhouette of flower of *P. sanctae-mariae* (*MacDougal & Miley 602GR*).

*Passiflora sanctae-mariae* is restricted to the western slopes of the Serrania Transístmica, or Cordillera Madre, of Chiapas, Mexico, and adjacent western Guatemala. It may be distinguished from the other members of series *Luteae* in Mesoamerica by the following key.

1a. Plant completely glabrous; peduncles (1.5–)3–5(–6) cm long; petals 3–4.5(–5) mm long; seeds usually 3–4(–5)-sulcate; elevation 1100 m or less ..... *P. filipes*

1b. Plant minutely puberulent to pubescent (except adaxial surface of lamina) at least on young growth and petioles; peduncles 1.1–2.6 cm long; petals 5–8 mm long; seeds usually 6–13-sulcate; elevation 1300–2800 m.

2a. Stems pubescent, or sparsely so below; leaves 1.5–5.5(–7) cm wide; corona 3–5 mm long; operculum pale greenish; androgynophore 4.8–5.5 mm long; seeds 6–7-sulcate (rarely irregularly rugose); elevation (1350–)1900–2800 m ..... *P. pavonis*

2b. Stems minutely or sparsely puberulent, or glabrescent below; leaves (4.7–)6–11.2 cm wide; corona 2–3 mm long; operculum dark purple; androgynophore 3.0–4.1 mm long; seeds 10–13-sulcate; elevation 1300–1500 m ..... *P. sanctae-mariae*

*Passiflora sanctae-mariae* was collected in the field in flower and fruit, then cultivated as a single

individual 1980–1986 at Duke University, with the type specimens collected in June 1982. Observations made on living material allowed the detailed descriptions of the flowers provided above. The flowers opened in the greenhouse around midday and closed in the late afternoon (the other species in the series open in early to mid-morning and close in the early to late afternoon). No autogamy was observed in six years of cultivation, and fifteen self pollinations failed to set fruit, good evidence that the species is self-incompatible.

Fruits and seeds are known only from my field collection; the number of seeds per fruit was 26, 29, 30, and 38 + 2 aborted, i.e., seeds 26–40 (N = 4). The number of seeds per fruit is significantly higher than its relatives in the series, which range from 2 to 12 (MacDougal, unpublished). A few of the seeds were germinated in the greenhouse to determine germination type, but the seedlings were not grown. The germination type is epigeal with elliptic foliaceous cotyledons, the norm for the genus, but is worth noting because the close relative *Passiflora lutea* has hypogeal germination, extremely rare in the genus (MacDougal, 1994). Germination type for the other species in the section is unknown.

As is the case in many of the passifloras in section *Decaloba*, the leaves of the juvenile plants of this species are often variegated (cf. Fig. 1F), but this condition is not retained at reproduction. The leaves tend to be larger than the other species of the section and are characteristically apically truncate or subtruncate, often giving the leaves a hemispherical or bat-wing shape. The common name *ala murciélago* is attached to some of the specimens, a name generally associated with many of the bilobed passifloras in northern Mesoamerica. One collector noted its use as a diuretic, a use also shared by several other bilobed passifloras in this area.

*Passiflora sanctae-mariae* is found only in premontane and lower montane wet forest. In Quezaltenango it is associated with *P. prolata* Masters, *P. helleri* Peyritsch, *P. biflora* Lamarck, and *P. membranacea* Bentham.

This species is dedicated to the Blessed Mother who is the namesake of the volcano where the clone of the type was collected, and who bore Jesus Christ whose sufferings are commemorated in the generic name.

*Paratypes.* GUATEMALA. **Quezaltenango:** 100 m up dirt road at Km post 197 on Hwy. 9S ca. 8 km below tunnel near Santa María de Jesús, old finca Pirineos on slopes near Volcán Santa María, ca. 1340 m, 20 Jan. 1980 (fl, fr), *MacDougal & Miley 602* (BM, DUKE, F, MEXU, MO); rich forested slopes along Quebrada San Gerónimo, finca Pirineos, lower S-facing slopes of Volcán Santa María between Santa María de Jesús and Calahuaché, 1–2 Jan. 1940, *Steyermark 33331* (F); top of ridge between finca Pirineos and finca Soledad, lower S-facing slopes of Volcán Santa María, 1300–1400 m, 5 Jan. 1940, *Steyermark 33525* (F). **San Marcos:** halfway up slopes above finca El Porvenir on "Todos Santos Chiquitos," lower S-facing slopes of Volcán Tajumulco, 1300–1500 m, 7 Mar. 1940, *Steyermark 37098* (F), *Steyermark 37215* (F). MEXICO. **Chiapas:** Mpio. de Angel Albino Corzo, above finca Tuxtepec, 1380 m, 21 Oct. 1980 (fl), *Breedlove & Strother 46719* (CAS), 7 Apr. 1981 (fl), *Breedlove 50768* (CAS), 24 June 1981 (fl), *Breedlove 51184* (CAS); finca Irlanda, June 1914, *Purpus 7292* (UC).

*Acknowledgments.* The type material was collected during fieldwork supported by NSF grant DEB–7912607 while I was a graduate student on an NSF Fellowship. I am grateful to Donald E. Stone and the other members of my graduate committee at Duke University, as well as the staff of the greenhouses there, for their guidance and assistance. John Myers prepared the drawing.

Literature Cited

Killip, E. P. 1938. The American species of Passifloraceae. Publ. Field Mus. Nat. Hist., Bot. Ser. 19: 1–613.

MacDougal, J. M. 1994. Revision of *Passiflora* subgenus *Decaloba* section *Pseudodysosmia* (Passifloraceae). Syst. Bot. Monogr. 41: 1–147.

Small, J. K. 1933. Manual of the Southeastern Flora. New York. [Published by the author.]

# New Combinations in Asian *Krascheninnikovia* Gueldenstaedt (Chenopodiaceae)

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ABSTRACT. New combinations in the genus *Krascheninnikovia* are proposed: *K. arborescens* (Losina-Losinskaja) Mosyakin, *K. compacta* (Losina-Losinskaja) Grubov var. *longipilosa* (Tsien Cho-po & Ma Cheng-gung) Mosyakin, and *Krascheninnikovia* sect. *Caudatae* (Aellen) Mosyakin.

*Krascheninnikovia* Gueldenstaedt (1772: 551) is the correct name for the genus previously commonly known as *Eurotia* Adanson and *Ceratoides* Gagnebin. This nomenclatural problem has been discussed by several authors over the years (Lozina-Lozinskaya, 1930; Reveal & Holmgren, 1972; Grubov, 1976; Guterman, 1975; Tomsovic, 1990; Tsvelev, 1993).

Unfortunately, when establishing the genus *Ceratoides*, Gagnebin (1755: 59) did not write a diagnosis, but rather only mentioned a pre-Linnaean work by Tournefort (1703). In the latter work the genus *Ceratoides* included both an annual species (later named by Linnaeus as *Ceratocarpus arenarius* L.), and a perennial one, which is conspecific with *Krascheninnikovia ceratoides* (L.) Gueldenstaedt. At the time of its establishment (Gagnebin, 1755) the genus *Ceratoides* included *Ceratocarpus arenarius*, the type of *Ceratocarpus* L. (1753); thus *Ceratoides* is a synonym of *Ceratocarpus*. The next available name for the genus is *Krascheninnikovia*. [More detailed discussion is provided by Guterman (1975) and Tsvelev (1993).] In the *Flora Reipublicae Popularis Sinicae* (Tsien Cho-po & Ma Cheng-gung, 1979) the name *Ceratoides* was accepted for this genus. Thus, the following new nomenclatural combinations are necessary for a forthcoming edition of the *Flora of China*.

**Krascheninnikovia arborescens** (Losina-Losinskaja) Mosyakin, comb. nov. Basionym: *Eurotia arborescens* Losina-Losinskaja, Izv. Akad. Nauk SSSR, Ser. 7, Otd. Fiz.-Mat. Nauk 1930, No. 9: 999. 1930. *Ceratoides arborescens* (Losina-Losinskaja) Tsien Cho-po & Ma Cheng-gung, Flora Reipublicae Popularis Sinicae 25(2): 27. 1979.

**Krascheninnikovia compacta** (Losina-Losinskaja) Grubov var. **longipilosa** (Tsien Cho-po & Ma Cheng-gung) Mosyakin, comb. nov. Basionym: *Ceratoides compacta* (Losina-Losinskaja) Tsien Cho-po & Ma Cheng-gung var. *longipilosa* Tsien Cho-po & Ma Cheng-gung, Flora Reipublicae Popularis Sinicae 25(2): 28. 1979.

When first describing the new variety *Ceratoides compacta* (Losina-Losinskaja) Tsien Cho-po & Ma Cheng-gung var. *longipilosa* Tsieng Cho-po & Ma Cheng-gung, the authors did not cite the basionym for their new combination at the species level (see Kung Hsien-wu et al., 1978). Thus, the complete combination (species plus variety) was validated later in the *Flora Reipublicae Popularis Sinicae* (Tsien Cho-po & Ma Cheng-gung, 1979).

Two sections, based mostly on the differences in the structure of trichomes, were established by Aellen (1952) for the genus *Eurotia*. The correct names for these sections, as well as a new combination for one of them, are given below.

**Krascheninnikovia** sect. **Krascheninnikovia**. TYPE: *Krascheninnikovia ceratoides* (L.) Gueldenstaedt (type of the genus).

*Eurotia* sect. *Ecaudatae* Aellen, Verh. Naturf. Ges. Basel 63: 267. 1952. TYPE: not designated.

Because in Aellen's (1952) treatment the section *Ecaudatae* included the type of the genus, this name should be replaced by the appropriate autonym.

**Krascheninnikovia** sect. **Caudatae** (Aellen) Mosyakin, comb. nov. Basionym: *Eurotia* sect. *Caudatae* Aellen, Verh. Naturf. Ges. Basel 63: 267. 1952. TYPE: *Eurotia compacta* Losina-Losinskaja = *Krascheninnikovia compacta* (Losina-Losinskaja) Grubov.

The native North American species previously commonly known as *Eurotia lanata* (Pursh) Moquin-Tandon was transferred to *Krascheninnikovia* by Meeuse & Smith (1974). If accepted as a distinct

entity, another North American taxon described by Rydberg (1912) as *Eurotia subspinosa* is in need of the same transfer or a new infraspecific combination. However, in view of the current work on the *Flora of North America* project, I believe this nomenclatural decision should be left to American botanists.

Literature Cited

Aellen, P. 1952. Ergebnisse einer botanisch-zoologischen Sammelreise durch den Iran. Botanische Ergebnisse II. Chenopodiaceae: *Agriophyllum*, *Esfandiaria*, *Eurotia*. Verh. Naturf. Ges. Basel 63: 253–272.

Gagnebin, A. 1755. Observations faites sur le systeme des autheurs de botanique et sur l'Ophris minima C.B. Acta Helv. Phys. Math. 2: 56–75.

Grubov, V. I. 1976. Proposal for conservation of the genus name *Eurotia* Adans. against *Axyris* Linn. Taxon 25: 362.

Gueldenstaedt, A. I. 1772. *Krascheninnikovia*, novum plantarum genus. Novi. Comment. Acad. Sci. Imp. Petrop. 16: 548–560.

Guterman, W. 1975. Notulae nomenclaturales. Phyton (Horn) 17 (1–2): 31–50.

Kung Hsien-wu, Chu Ge-ling, Tsien Cho-po, Li An-jen & Ma Cheng-gung. 1978. The Chenopodiaceae in China. Acta Phytotax. Sin. 16(1): 117.

Lozina-Lozinskaya (Losina-Losinskaja), A. S. 1930. Materialy po izucheniyu roda *Eurotia* (Materials for the study of the genus *Eurotia*). Izv. Akad. Nauk SSSR, Ser. 7, Otd. Fiz.-Mat. Nauk 1930, No. 9: 977–1007.

Meeuse, A. D. J. & A. Smith. 1974. A new combination in *Krascheninnikovia* (Chenopod.). Taxon 20: 644.

Reveal, J. L. & N. M. Holmgren. 1972. *Ceratoides*, an older generic name for *Krascheninnikovia* and *Eurotia*. Taxon 21: 209.

Rydberg, P. A. 1912. Studies of the Rocky Mt. Flora—XXVII. Bull. Torrey Bot. Club 39: 310–328.

Tomsovic, P. 1990. Patří druh *Ceratoides latens* (*Eurotia ceratoides*) do československé květeny? (Does *Ceratoides latens* (*Eurotia ceratoides*) belong to the flora of Czechoslovakia?). Preslia (Praha) 62: 33–39.

Tournefort, J. P. 1703 (repr. 1719). Corollarium institutionum rei herbariae. Lugdunii.

Tsien Cho-po & Ma Cheng-gung. 1979. *Ceratoides* (Tourn.) Gagnebin. Pp. 24–28 *in* Flora Reipublicae Popularis Sinicae. Vol. 25(2). Beijing.

Tsvelev, N. N. 1993. Zametki o marevykh (Chenopodiaceae) Vostochnoy Evropy (Notes on Chenopodiaceae of Eastern Europe). Ukrayins'k. Bot. Zhurn. 50(1): 78–85.

# A New Species of *Oserya* (Podostemaceae) from Jalisco, Mexico

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ABSTRACT. A new species of Podostemaceae, *Oserya longifolia*, from Jalisco, Mexico, is described and illustrated. Leaf length is the most prominent feature that distinguishes this species.

RESUMEN. Se describe e ilustra una especie nueva de la familia Podostemaceae, *Oserya longifolia*, del estado de Jalisco, México. La longitud de la hoja es la característica más prominente que distingue a esta especie.

*Oserya* Tulasne & Weddell is an American genus of six species, most recently monographed by van Royen (1954). Like all Podostemaceae, species of *Oserya* grow attached to rocks in swift-moving river currents. Five of the six species (*O. biceps* Tulasne & Weddell, *O. flabellifera* Tulasne & Weddell, *O. minima* van Royen, *O. perpusilla* (Went) van Royen, *O. sphaerocarpa* Tulasne) occur in northern Brazil and northeastern South America, while *O. coulteriana* Tulasne occurs in Mexico.

Little is known of the geographic distributions of species of *Oserya*. In fact, four of the South American species are known only from the type collections. At the time of van Royen's monograph, *O. coulteriana* was known from few collections in the Mexican states of Jalisco and Michoacán. During our recent studies of Mexican Podostemaceae we have found this species to be relatively widespread in Colima, Nayarit, and Guerrero, in addition to Jalisco and Michoacán. A collection from southern Sinaloa is also now known (Novelo & Philbrick, unpublished).

While conducting field studies of Mexican Podostemaceae, we made collections that did not correspond to any described species. These collections serve as the basis for the description of a new species, *Oserya longifolia* Novelo & Philbrick.

**Oserya longifolia** Novelo & Philbrick, sp. nov. TYPE: Mexico. Estado de Jalisco: municipio de La Huerta, Río Purificación, 4 km al oeste de La Huerta, 19°30′N, 104°40′W, 300 m, 26 Mar. 1993, *Novelo & Philbrick 1166* (holotype, MEXU; isotypes, MO, NY, WCSU). Figure 1.

Herbae aquaticae plerumque caulibus stoloniferis applanatis. Folia circinata usque ad 40 cm longa; petiolus laevis; lamina repetite 2–4(–5)-divisa, divisionibus ultimis 0.3–0.6 mm latis, applanatis, apice acutis. Flores hermaphroditi, zygomorphi, pedicellati, axillares, solitarii. Tepala 3, filamentis alternata, uno in furca duorum staminum affixo. Stamina 2, andropodio portata; antherae ellipticae, dorsifixae, per 2 rimas laterales longitudinaliter dehiscentes. Ovarium 2 carpellis, 2 stylis 0.7–1.2 mm longi. Fructus 2 valvis, quaque valva 3-costata.

Aquatic herbs usually with stoloniferous and flattened stems 0.8–1.0 mm diam., strongly adhering to rocks. Leaves alternate, circinate, up to 40 cm long, petiole 2–17 cm long, cylindrical, smooth, 0.7–1.6 mm diam., with a broadened base; blade 2–4(–5) divided, the ultimate divisions 0.3–0.6 mm wide, flattened, apex acute. Flowers hermaphroditic, zygomorphic, pedicellate, borne singly, axillary, protected by a spathella; spathella up to 7 mm long, thin clavate. Pedicels 3.5–8.0 mm long, elongating during anthesis, not expanded at capsule base. Tepals 3, alternate with the filaments, free, membranous, subulate, one of them attached in the fork between the two stamens; lateral tepals 0.9–1.2 mm long, medial tepal 0.7–0.9 mm long. Stamens 2, borne by an andropodium, andropodium 0.8–1.3 mm long, elongating during anthesis; filaments 1.0–1.8 mm long, subulate, flattened, elongating during anthesis, deciduous; anthers 0.4–0.6(–0.8) mm long, elliptic, dorsifixed, 2-celled, dehiscing longitudinally by 2 lateral slits. Ovary superior, 1.7–2.1 mm long,

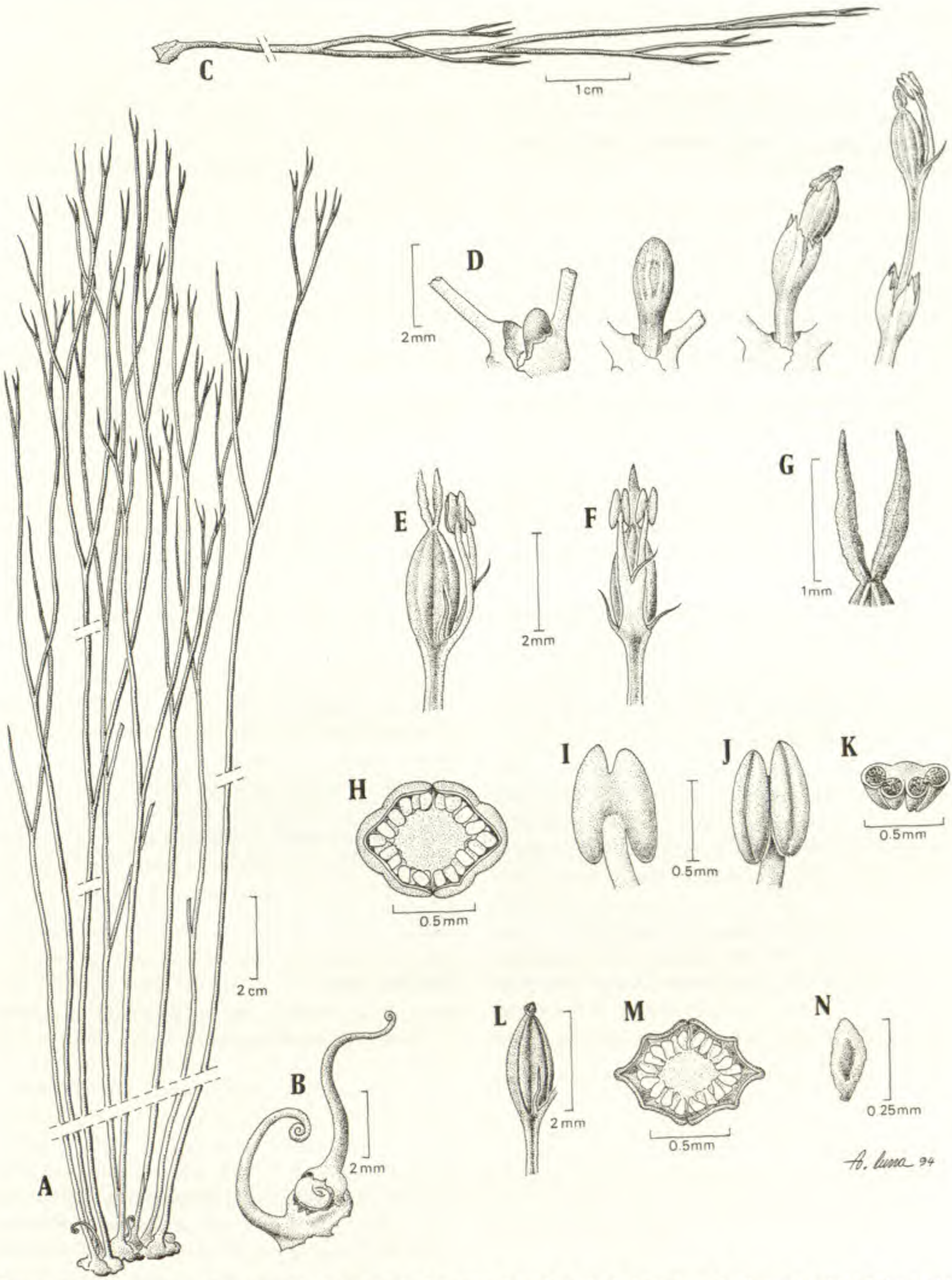


Figure 1. *Oserya longifolia* Novelo & Philbrick. Drawings based on the holotype. —A. General habit of plant with several parts of the leaves interrupted (longest leaf 40.1 cm). —B. Top of the stem with several circinate new leaves. —C. Detail of a single leaf (26.7 cm long). —D. Several stages of flower development from between leaf bases, before (left) and after (right) the spathella is ruptured. —E. Lateral view of the mature flower showing orientation of the styles, anthers, and tepals at the time of dehiscence. —F. Abaxial view of the mature flower showing the andropodium and tepals. —G. Mature styles with receptive stigmas. —H. Cross section of ovary showing placenta and numerous ovules. —I. Abaxial view of a single anther. —J. Adaxial view of a single anther. —K. Cross section of anther. —L. Mature fruit. —M. Cross section of a capsule showing ribs and dehiscence points of the capsule valves. —N. Seed.

ellipsoid, 2-locular; styles 2, 0.7–1.2 mm long, free, conical, ovules numerous, placenta axile. Fruit 1.7–2.6 mm long and 0.8–1.2 mm diam., 2-locular capsule, suture margins thickened; valves 2, each 3-ribbed. Seeds 0.24–0.26 mm long, 0.16–0.20 mm wide, obovoid. Pollen 14.88 $\mu$m (SD 0.9, N = 30) diam., tricolpate.

*Oserya longifolia* grows submerged in the swift currents of river rapids, attached directly to rocks of various sizes. No other species of Podostemaceae were observed growing with *Oserya longifolia*, although a large population of *Eichhornia crassipes* (Martius) Solms-Laubach occurs in areas of slow current in association with *O. longifolia*.

Thus far, *Oserya longifolia* has only been collected in the Purificación River, in areas of full sun. The largest leaves (up to 40 cm long) were found on plants that are submerged in areas of very fast current. In areas of slow current, or when the plants are exposed as the water level drops, the terminal portions of the leaves fall away, leaving the short, coarse bases.

Two species of *Oserya* are now known from Mexico: *O. coulteriana* and *O. longifolia*. These species are readily distinguished. *Oserya longifolia* is the larger, more robust of the two (Table 1). The longer leaf of *O. longifolia* (15–40 cm vs. 2–10 cm for *O. coulteriana*) is particularly notable. However, the tepal that occurs between the anthers at the apex of the andropodium is shorter in *O. longifolia* than in *O. coulteriana* (Table 1). Two qualitative features also distinguish the species: the petioles of *O. longifolia* are cylindrical in cross section, whereas those of *O. coulteriana* are markedly flattened, and distinct petiolar spines are common in *O. coulteriana* whereas they are lacking in *O. longifolia*.

Leaf length also distinguishes *Oserya longifolia* from the five South American species of the genus. Leaf length of all South American species ranges from 2 to 3 cm, while leaves of *O. longifolia* range from 15 to 40 cm. In addition, all five South American species have a single stamen; in contrast, both *O. longifolia* and *O. coulteriana* possess two stamens (occasional plants of the latter species have a single stamen).

TABLE 1. Vegetative and floral characteristics that distinguish *Oserya longifolia* from *O. coulteriana*.

| Characteristic | *O. longifolia* | *O. coulteriana* |
|---|---|---|
| Petiole shape (cross section) | cylindrical | flattened |
| Petiolar spines | absent | usually present |
| Leaf length | 15–40 cm | 2–10 cm |
| Width of ultimate leaf division | 0.3–0.6 mm | 0.1–0.3 mm |
| Spathella length | 5–7 mm | 3–6 mm |
| Pedicel length | 3.5–8.0 mm | 2.0–6.0 mm |
| Length of medial tepal | 0.7–0.9 mm | 1–1.3 mm |
| Andropodium length | 0.8–1.3 mm | 0.2–0.5 mm |
| Anther length | 0.4–0.6 (–0.8) mm | 0.75–1.10 mm |
| Fruit length | 1.7–2.6 mm | 1.8–2 mm |

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Literature Cited

Royen, P. van. 1954. The Podostemaceae of the New World. III. Acta Bot. Neerl. 3: 215–263.

# *Impatiens kulamavuensis*, a New Species of Balsaminaceae from India

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ABSTRACT. *Impatiens kulamavuensis*, a distinct new species from India allied to *I. parasitica* Beddome, is described.

**Impatiens kulamavuensis** A. G. Pandurangan & V. J. Nair, sp. nov. TYPE: India. Kerala: Idukki Dist., Meenmutty-Kulamavu, ± 700 m, 6 Oct. 1983, *A. G. Pandurangan 82037* (holotype, CAL; isotype, MH). Figure 1.

Ab *Impatiente parasitica* Beddome caulibus stoloniferis, foliis glandulosis, nervis lateralibus non manifestis; sepalis lateralibus et petalis pilosis; stigmatibus curvatis, sericeo-pubescentibus et seminibus pyriformibus differt.

Epiphytic stoloniferous herbs; stems short, stout, fleshy, less than 1 cm long. Leaves alternate; petioles gland-dotted, 2–7 mm long, with 2 prominent stipitate glands near the base of the blade; lamina ovate-lanceolate, 2–5.5 × 1.5–2.5 cm, membranous, gland-dotted above, glabrous below, deep green, the base cuneate, the apex acuminate, margins entire to obscurely crenulate-serrate, crenules 2–4 mm apart; lateral veins 4–6 pairs, indistinct. Inflorescence a 1–3-flowered raceme; peduncles 2.5–5 cm long; pedicels 3.5–5 cm long. Flowers greenish yellow. Lateral sepals linear, 8–10 × 2–3 mm, hairy outside, glabrous inside. Lower sepal saccate, compressed, 12–15 × 5–7 mm, glabrous; spurs strongly curved, 7–8 × 3–5 mm, tip obtuse. Dorsal petal erect, orbicular to ovate, 6–7 × 8–9 mm, hairy at base. Lateral petals united close to the base, 3-lobed, upper lobes smaller in size, 7–8 × 9–10 mm. Androecium 3–3.5 mm long. Ovary ellipsoid, glabrous, 5–6 × 3–3.5 mm; ovules many, 1-seriate; style short; stigma curved, with an obtuse tip, silky pubescent. Capsules ellipsoid, 10–12 × 4–5 mm, glabrous. Seeds pear-shaped, smooth. Flowering and fruiting October–December.

*Distribution*. Endemic to Meenmutty-Kulamavu, Idukki Dist., Kerala, India.

TABLE 1. Comparison of major differences between *Impatiens parasitica* Beddome and *Impatiens kulamavuensis* A. G. Pandurangan & V. J. Nair.

| *I. parasitica* | *I. kulamavuensis* |
|---|---|
| Stems 10–12 cm long, not stoloniferous, moniliform | Stems less than 1 cm long, stoloniferous, not moniliform |
| Leaves glabrous on both surfaces or glabrescent above; lateral nerves prominent | Leaves glanduliferous above, glabrous beneath; lateral nerves indistinct |
| Lateral sepals glabrous outside, glandular inside at base | Lateral sepals hairy outside, glabrous inside |
| Petals glanduliferous inside at base | Petals hairy inside at base |
| Stigmas straight; stigmatic lobes 5-toothed, not pubescent | Stigmas curved; lobes not 5-toothed, obtuse, silky pubescent |
| Seeds rounded to ellipsoid | Seeds pear-shaped |

*Habitat and ecology*. Epiphytic herbs, growing on moss-clad tree trunks at an altitude of 600–700 m. The host trees are *Elaeocarpus tuberculatus* Roxburgh and *Pygium wightiana* Blume.

*Impatiens kulamavuensis* was collected in the Idukki hydroelectric project area, Kerala. It is allied to *I. parasitica* Beddome, but differs in the characters listed in Table 1.

*Paratype*. INDIA. **Kerala:** Idukki dist., Meenmutty, ± 600 m, 30 Dec. 1983, *A. G. Pandurangan 62585* (MH).

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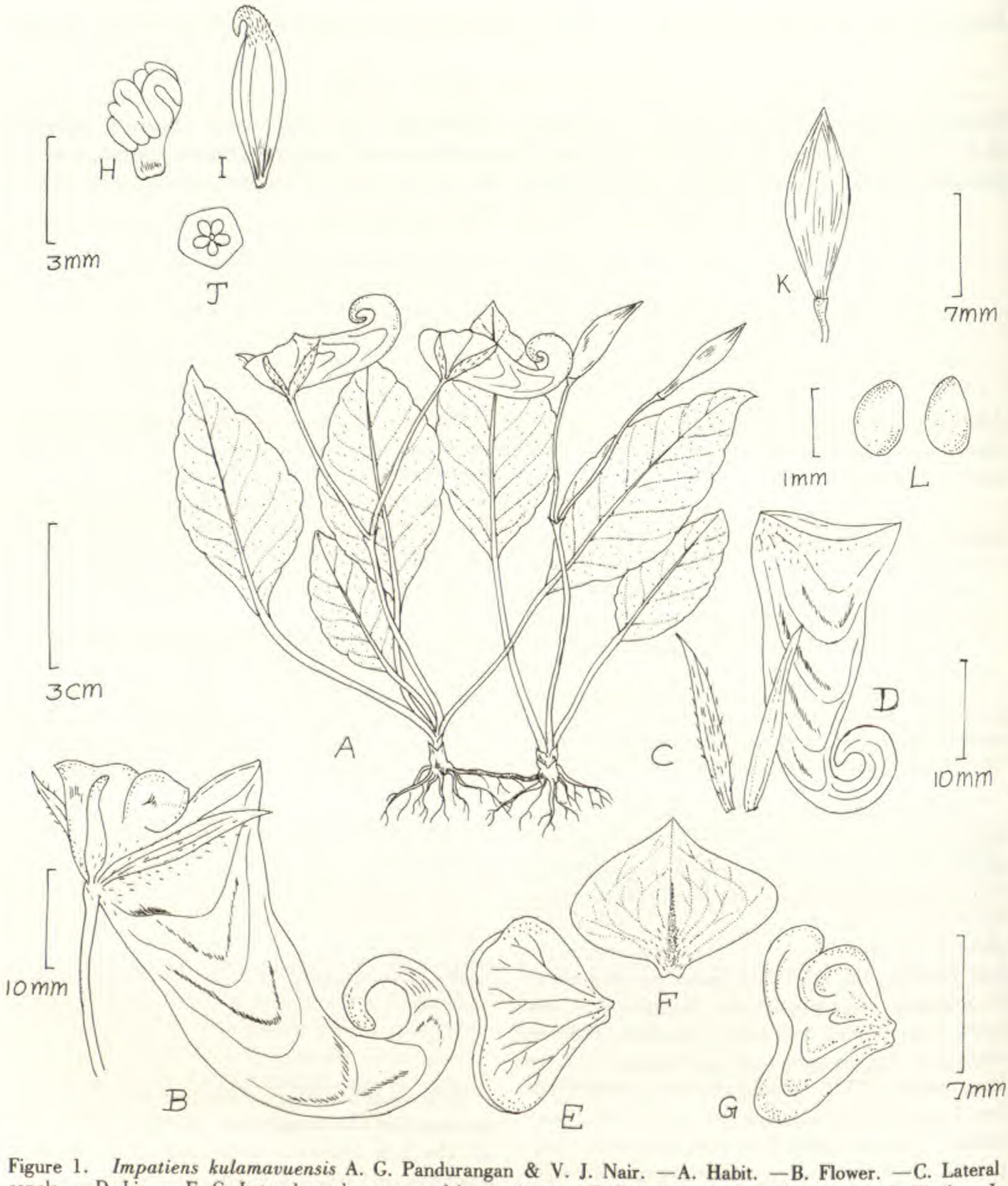


Figure 1. *Impatiens kulamavuensis* A. G. Pandurangan & V. J. Nair. —A. Habit. —B. Flower. —C. Lateral sepals. —D. Lip. —E, G. Lateral petals, outer and inner views. —F. Dorsal petal. —H. Stamens. —I. Pistil. —J. Transection of ovary. —K. Fruit. —L. Seeds.

# Two New Taxa for the *Flora of Thailand*

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ABSTRACT. The new subspecies *Mitrasacme erophila* subsp. *grandiflora* (Loganiaceae) and *Pedicularis thailandica* subsp. *parvula* (Scrophulariaceae) are described.

*Mitrasacme* is a widespread Australasian genus, represented in Thailand by three undercollected species. In order to make a name available for the forthcoming *Flora of Thailand* account, the following new subspecies is described.

**Mitrasacme erophila** Leenhouts subsp. **grandiflora** J. Parnell & O. Griffin, subsp. nov. TYPE: Thailand. Chiang Mai, Omkoi, ca. 35 km from pine improvement centre to Omkoi, 29 Dec. 1978, *C. Niyomdham, M. Suangtho & B. Sangkhachand 168* (holotype, L; isotype, AAU).

A subsp. *erophila* foliis glandulis minutis instructis, corolla grandiore, stamenibusque basim corollae versus affixis differt.

Herb to 20 cm. Stem < 1 cm high, unbranched, minutely papillose. Leaves 2–4 pairs at the base of the plant, ovate, < 4 mm long, with a single distinct mid-vein; apex acute to blunt. Inflorescence terminal, lax, branched and umbellate, many-flowered; peduncles 1–3 arising from the stem with 1–5 minute, triangular bracteoles either sterile or subtending the inflorescence branches; pedicels to 4.2 cm, glabrous. Flowers white. Calyx 1.5–2 mm long, campanulate; lobes 0.7–1 mm. Corolla 5–6.7 mm long, campanulate; lobes 1.2–1.7 mm, oblong, mucronate. Fruit 1.5–2 mm high; styles connate at the tips; becoming freer with maturity.

*Mitrasacme erophila* subsp. *grandiflora* differs from subspecies *erophila* in its leaves, which bear minute peltate scales on their upper surface, its longer corolla (the corolla in subspecies *erophila* is 3–3.7 mm long) with larger, rounded corolla lobes (the corolla lobes in subspecies *erophila* are oblong and 1.2–1.7 mm long) and in the position of the stamens' insertion in the corolla tube (the stamens in subspecies *erophila* are attached at or above the center). Subspecies *grandiflora* is known only from the type collection.

*Pedicularis* in Thailand has been recently revised for the *Flora of Thailand*, where four species are recognized (Yamazaki, 1990). This account does not fully document the great variability seen in Thai material, and some herbarium material does not match that of any of the described species. Material collected by the first joint expedition of the Royal Botanic Gardens, Kew, Trinity College, Dublin, and Khon Kaen University, although conspecific with *Pedicularis thailandica*, is sufficiently distinct to require circumscription.

**Pedicularis thailandica** Yamazaki subsp. **parvula** J. Parnell, subsp. nov. TYPE: Thailand. Chiang Mai, Doi Inthanon National Park, forest trail at km 42 along summit road, hill evergreen forest, 7 Oct. 1990, *P. Chantaranothai, J. Parnell, D. Simpson & R. Pooma 90/613* (holotype, TCD).

A subsp. *thailandica* statura minore; caulibus vix lanatis; foliis minutis una cum floribus ternis verticillatis et corolla alba differt.

Herb to 17 cm. Stems erect, simple, subglabrous. Leaves 3-verticillate; petioles 2 mm, sparsely lanate; blades ovate, deeply pinnate, the pinnules crenate. Flowers solitary, 3-verticillate; pedicels 0.2–0.5 mm. Calyx tubular-campanulate, 5.5 × 4 mm, sparsely lanate, 5-toothed; teeth rounded, ca. 2 mm long. Corolla white, 18–20 mm long, tube straight, 12 × 2 mm, densely glandular-pilose especially on the lobes and hood; hood (galea) ca. 3.5 mm; straight near the mouth, abruptly curved near the tube, two-toothed; lower lip three-lobed, all lobes broadly oblong. Stamens with glabrous filaments ca. 10 mm long; anthers deltoid, ca. 1.5 mm long. Mature capsule unknown. Subspecies *parvula* is known only from the type collection.

*Pedicularis thailandica* subsp. *parvula* differs from subspecies *thailandica* in being only half its height, with the main stem almost glabrous (vs. spreadingly lanate); the leaves being much smaller and not duplicate-serrate; and the flowers being in whorls of three (vs. four) with a white (vs. yellow) corolla.

*Acknowledgments.* I thank P. Chantaranothai and R. Pooma, who were jointly responsible for arranging the field excursion to Doi Inthanon, D. A. Webb for helping with the Latin, and D. Middleton for commenting on a draft of this paper.

Literature Cited

Yamazaki, T. 1990. Scrophulariaceae. *In:* T. Smitinand & K. Larsen (editors), Flora of Thailand, 5: 139–238.

# New Species of *Siparuna* (Monimiaceae) I. Four New Species from Ecuador and Colombia

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ABSTRACT. *Siparuna croatii* and *S. palenquensis* from central and Pacific Ecuador, respectively, *S. gigantotepala* from Pacific Colombia and Ecuador, and *S. harlingii* from the eastern Andean slopes of Colombia and Ecuador are described, illustrated, and discussed as to their relationships with morphologically similar species.

Comprising an estimated 150 species, *Siparuna* is the largest and least understood genus of the Monimiaceae. The genus was last revised by Perkins (1901, 1911), whose typological species concept overstates diversity in certain areas, such as planaltan and southeastern Brazil. In Colombia, Ecuador, and Peru, however, increased collecting activity over the past 20 years has turned up numerous new species, and it now appears that most species of *Siparuna* are Andean in distribution. Material in the major relevant herbaria (acronyms following Holmgren et al., 1990), such as AAU, BM, COL, F, G, GB, GH, GOET, K, M, MA, MJG, MO, NY, OXF, P, QCA, QCNE, S, SEL, TCD, UC, US, W, WU, and Z, currently amounts to over 2500 collections representing approximately 100 species from the Andes. Continued discovery of new taxa in upper Amazonia strongly suggests the need for additional collecting. As a result of ongoing work toward a monograph of *Siparuna*, we herein describe four new species in order to make their names available for the forthcoming treatment of the Monimiaceae for the *Flora of Ecuador*. Work on the Peruvian species is still in progress, rendering description of several apparently new species extending south beyond Ecuador inadvisable.

Flowers of *Siparuna* are small and unisexual, and plants are monoecious or dioecious (Perkins, 1901; Feil, 1992). The flowers have an obconical or urceolate floral cup in which the free carpels or stamens are more or less completely enclosed (e.g., Figs. 1A, and 4B and F) and usually minute (1–4 mm) tepals. A feature characteristic of the genus is that the floral apex forms a roof, called a velum, with a central pore through which the upper parts of the stamens or styles protrude (for details of floral ontogeny and a morphological interpretation of the velum, see Endress, 1980). In the male flowers, the velum is more or less raised at anthesis and the pore is relatively large (Fig. 1A); in the female flowers, the inner margin of the velum is always distinctly raised and the pore is narrower (Fig. 1C).

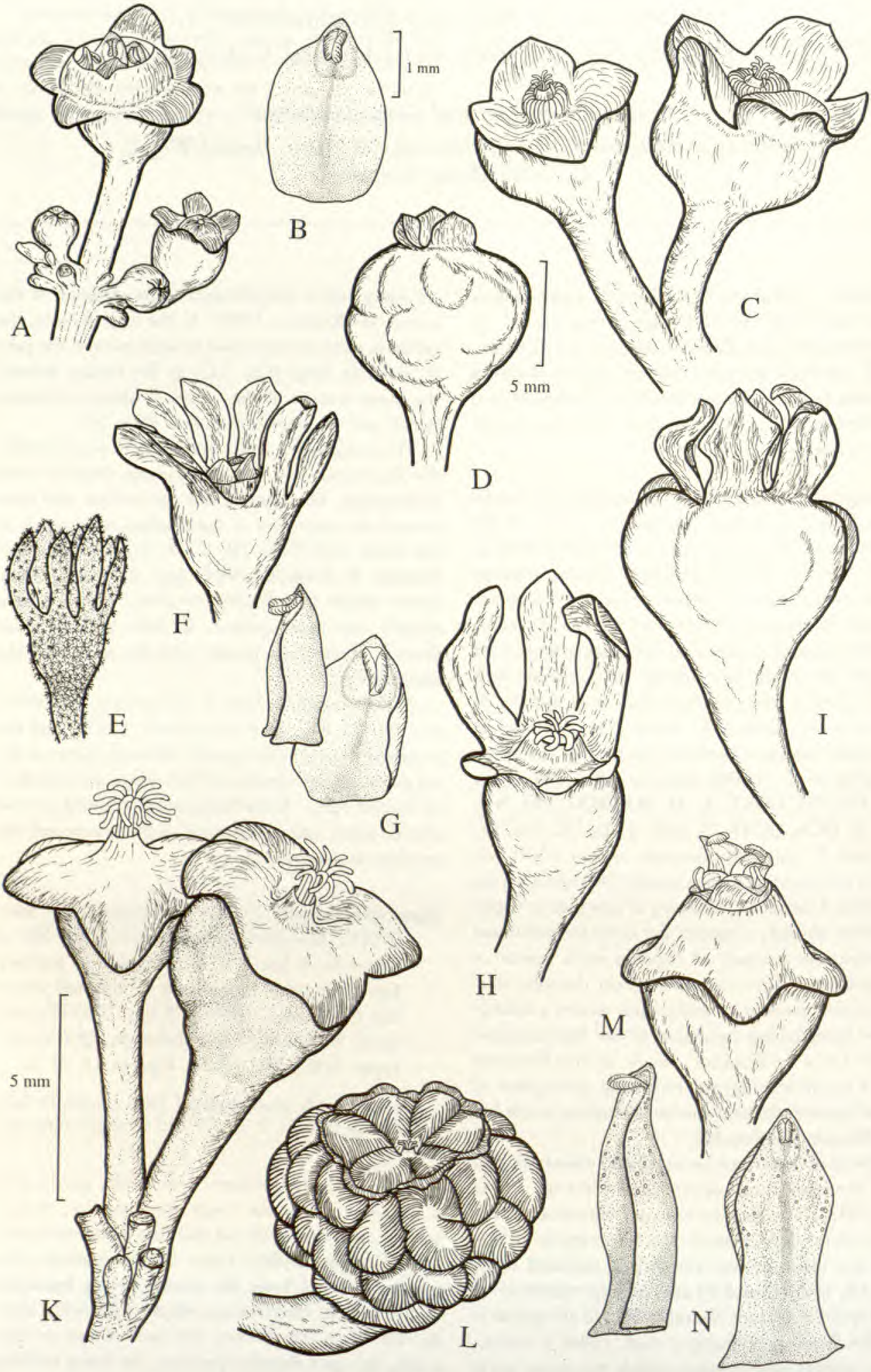
The stamens are sessile and initiated centripetally, the innermost ones often remaining small or even staminodial. The anthers are two-locular and open around the perimeter of both pollen sacs except at the distal end (Figs. 1B, G, N; 4G; compare also Endress & Hufford, 1989, figs. 97–100). Dehiscence results in a flaplike structure that is hinged distally and bent upward. In fully anthetic male flowers, these flaps usually can be seen with the unaided eye.

Anthesis typically lasts 9–16 days in male flowers and 16–24 days in females (Feil, 1992), and the fertilized flowers then expand. Measurements of floral parts and descriptions of their shape are therefore of limited value. More diagnostically useful are the shape, color, and pubescence of the leaves and the number of stamens and styles.

**Siparuna croatii** Renner & Hausner, sp. nov.
TYPE: Ecuador. Cotopaxi: 63.4 km SE of Quevedo, 6 km NW of El Corazón, primary forest on steep slopes near a waterfall above Río Angamarca, 1030 m, 4 Apr. 1983 (female, fl), *T. B. Croat 55752* (holotype, QCNE; isotypes, AAU, MO, QCA). Figures 1A–D, 2.

Species ramulis quadrangularis valde sulcatis et foliis late ellipticis (18–42 × 10–20 cm) a congeneribus diversa.

Dioecious shrub or tree, 4–5 m tall, partly with a liana-like habit, the twigs quadrangular, deeply sulcate, and khaki-colored due to a dense indumentum of minute stellate hairs. Leaves opposite, the petioles 4–5 cm long; the lamina drying brownish to olive-green, chartaceous, elliptic to broadly elliptic, 18–42 × 10–20 cm, the base obtuse or subacute, the apex shortly apiculate, the lower surface with minute appressed stellate hairs, the upper sur-


1 mm
A
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face scantily stellate-pubescent to glabrescent and rather smooth, with 22–24 pairs of secondary veins, the secondary and tertiary veins distinctly prominulous and yellow below, the margin inconspicuously denticulate. Cymes of both sexes axillary in groups of 2–4, ample and multiflorous, 3–5 cm long, with minute yellowish khaki stellate hairs. Male flower at anthesis 1.9–2.1 × 1.8–2.1 mm, the floral cup urceolate to globose with minute stellate hairs, the floral roof moderately raised, glabrous and drying dark brown, the 4–5 tepals obtusely triangular and 0.4–0.6 mm long, when fresh greenish; stamens 6, fleshy and containing white globules (large oil cells), the 4 outer ones slightly exserted at anthesis. Female flowers at anthesis of the same size and shape as the males but the floral roof raised to a cylindrical bulge separated by a distinct groove from a second innermost tube sheathing the style bases; the styles 5–7, basally united. Fruit fleshy and red when fresh; mature fruit and seeds unknown.

*Distribution, habitat, and phenology*. Endemic in central Ecuador; growing in primary montane forest on steep slopes and in secondary scrub at elevations of 1000–1400 m; collected flowering and with young fruits in April and May.

*Siparuna croatii* differs from all other species in the genus in its khaki-colored, deeply sulcate, quadrangular branchlets, olive-green leaves with secondary and tertiary veins distinctly raised below, and, for the genus, ample, khaki-colored inflorescences with small flowers.

*Paratype*. ECUADOR. **Manabí:** trail from El Corazón to Facundo Velo, 1–3 km S of El Corazón, 1400 m, 17 May 1980 (male, fl), *Harling & Andersson 19216* (AAU, GB, MJG, QCA).

**Siparuna palenquensis** Renner & Hausner, sp. nov. TYPE: Ecuador. Pichincha: Hcda. Covadonga on Río Pilatón, 1000 m, 2 July 1955 (male, fl), *E. Asplund 16764* (holotype, S; isotypes, MJG, QCA). Figures 1K–N, 3.

A *Siparuna eggersii* Hieronymus foliis obovatis (16–27 × 10–17 cm) differt.

Dioecious tree, 4–10 m tall, young branchlets densely pubescent with minute stellate hairs, older branches dark brown and subglabrous, terete. Leaves opposite, the petioles 1.5–4.5 cm long; the lamina drying olive-green or brown, chartaceous, obovate, 16–27 × 10–17 cm, the base cordate, truncate, or rounded, the apex shortly apiculate, both surfaces rather rough and scantily to moderately stellate-pubescent, with 10–13(–16) pairs of secondary veins, veins to the third order impressed above, distinctly visible below, the margin minutely denticulate. Cymes of both sexes axillary in groups of 2–4 and multiflorous (less so in the females), 1.5–4 cm long, and almost glabrous. Male flower at anthesis ca. 5.5–6.3 × 5–5.5 mm, the floral cup obconical with scant stellate hairs, the floral roof strongly raised, glabrous and drying dark brown or black, the 4–5 tepals nearly completely fused, fresh greenish yellow; stamens 6, often with 4 outer and 2 central ones, fleshy and containing white globules (oil cells), the outer stamens distinctly exserted at anthesis. Female flowers at anthesis of the same size and shape as the males; the styles ca. 15–30, basally united. Fruit fleshy, ca. 1.3–2 × 1–2 cm, fresh immature light green with sparse blackish scales, mature yellowish or reddish orange and smelling strongly of lemon; the 15–30 seeds distinctly visible in dried fruits, verrucose, gray, and with a red aril when fresh.

*Distribution, habitat, and phenology*. Restricted to Pacific Ecuador and described by collectors as infrequent or rare; growing in disturbed premontane forests on steep slopes or on cliffs; sea level to 1200 m; collected flowering and fruiting mainly from April to September.

The suggested relative, *Siparuna eggersii* Hieronymus, has smaller, obovate leaves (usually 12–15 × 8–10 cm) with cuneate bases. The two species have previously been confused, as, for example, in the florula of the Río Palenque Biological Station by Dodson & Gentry (1978), which describes and illustrates specimens of *S. palenquensis* as *S. eggersii*.

*Paratypes*. ECUADOR. **Esmeraldas:** NE across Río Blanco from Quinindé, *Little 6230* (F, K, US). **Los Ríos:** Río Palenque Biological Station, *Dodson 5134* (AAU, F, MO, QCA, SEL, US), *Dodson 5723* (MO, QCA, SEL,

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Figure 1. A–D. *Siparuna croatii* Renner & Hausner (A, B, *Harling & Andersson 19216*; C, D, *Croat 55752*). —A. Part of male inflorescence. —B. Stamen. —C. Female flowers. —D. Young fruit. E–I. *Siparuna gigantotepala* Renner & Hausner (E, *Barfod et al. 48903*; F, G, *Cuatrecasas 15746*; H, I, *Rubio et al. 999*). —E. Young male flower. —F. Mature male flower. —G. Stamens. —H. Female flower. —I. Young fruit. K–N. *Siparuna palenquensis* Renner & Hausner (K, *Øllgaard 98054*; L, *Jaramillo 44*; M, *Dodson 5134*; N, *Asplund 16764*). —K. Female flowers. —L. Mature fruit. —M. Male flower. —N. Stamens. The following parts share the same magnification: A, C, E, F, H, I, K, M; B, G, N; and D, L.

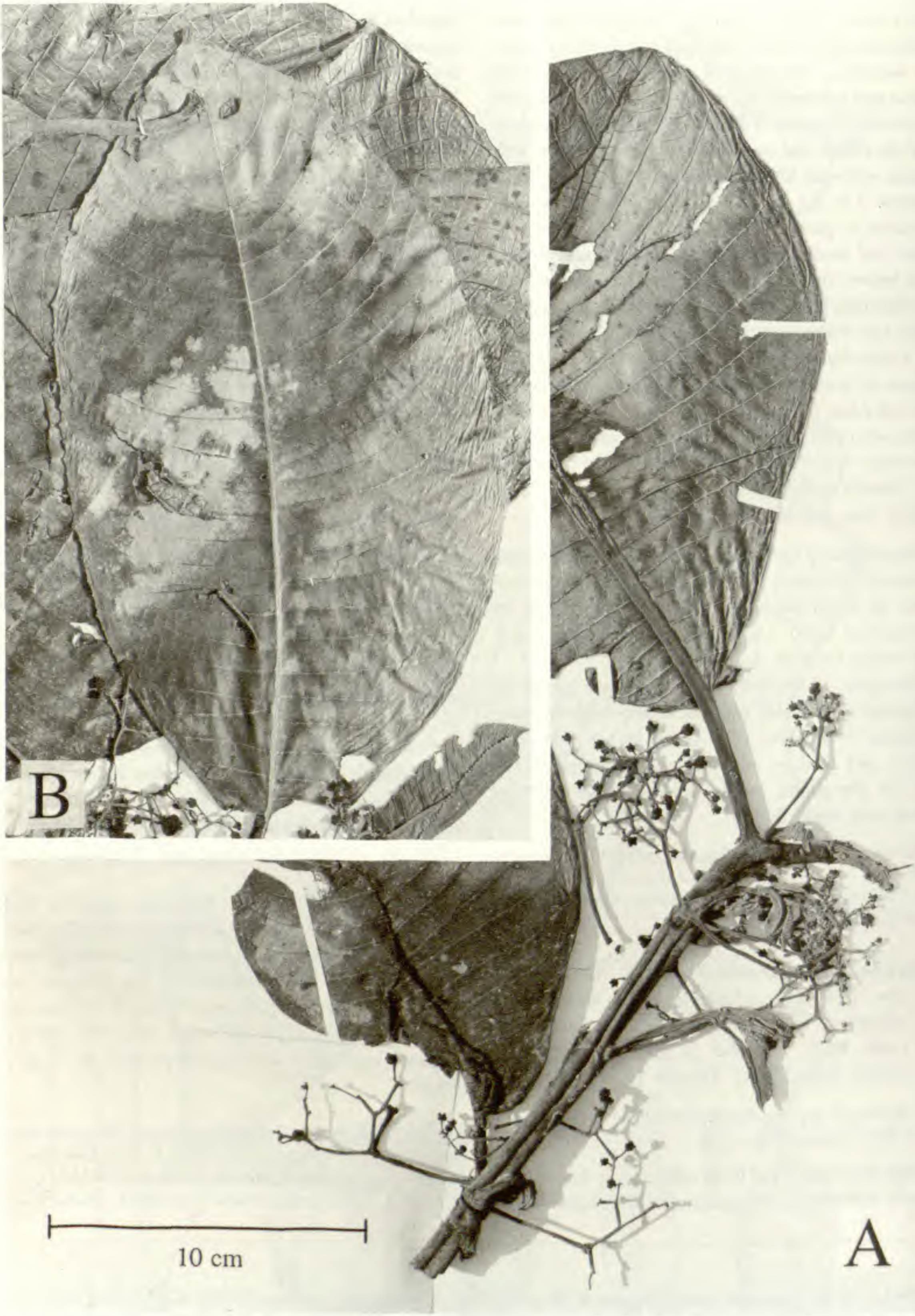


Figure 2. Female specimens of *Siparuna croatii* Renner & Hausner *(Croat 55752)*. —A. AAU isotype. —B. MO isotype.

Figure 3. Female specimens of *Siparuna palenquensis* Renner & Hausner. —A. *Croat 55702*. —B. *Øllgaard 98054*, AAU, paratype.

US), *Dodson 5930* (MO, NY, SEL, US), *Gentry & Dodson 17970* (MO, QCA). **Pichincha:** Pichincha, ca. 8 km SE of La Aurora, km 7 on Sto. Domingo–Quevedo rd., at bridge over Río Baba, *Øllgaard 98054* (AAU, QCA); Tinalandia, 9.6 km E of Santo Domingo de los Colorados, above Río Toáchi, *Croat 55702* (AAU, MO); km 3 of Toáchi–Las Pampas rd., *Dodson & Gentry 13708* (F, MO, QCNE, SEL); old rd. Quito–Santo Domingo, 2–9 km NE of turn-off to old rd. of Alluriquin, *Luteyn et al. 8736* (AAU, NY, QCA, QCNE); Aloag–Santo Domingo, Toáchi, at the confluence between Río Pilatón and Río Toáchi, *Sparre 13829* (MJG, S). **Cotopaxi:** island in Río San Pablo, near La Maná, *Webster 22727* (UC).

**Siparuna harlingii** Renner & Hausner, sp. nov. TYPE: Ecuador. Morona–Santiago: 7–8 km N of Gualaquiza on rd. to Indanza, 1500 m, 16 Apr. 1985 (male, fl), *G. Harling & L. Andersson 24175* (holotype, QCA; isotypes, AAU, GB). Figure 4.

Species *Siparunae asperae* (Ruiz & Pavón) A. DC. proxima, cujus flores foliorumque texturam et colorem habet. Differt floribus fructibusque minus pubescentibus et pedicellis paullo incrassatis.

Dioecious tree or shrub, sometimes scandent, 2–6(–12) m tall, the young and older branchlets densely pubescent with stellate hairs, subangular. Leaves opposite and those of a pair slightly unequal in size, the petioles (2–)2.5–4(–7) cm long; the lamina drying dark green to dark brown, papery, brittle, and subbullate to rather smooth, elliptic to broadly elliptic, sometimes narrowly elliptic, 18–35 × 9–22 cm, the base truncate to cordate, occasionally rounded or acute, the apex acuminate, both surfaces densely stellate-pubescent, glabrescent on the upper surface, with (8–)12–13(–15) pairs of secondary veins, these distinctly visible on the upper surface and slightly raised and yellowish brown pubescent on the lower surface, the tertiary venation dense and distinctly visible, the margin finely denticulate. Cymes of both sexes axillary in groups of 2–4, much-branched (less so in the females), 2–5 cm long, with minute stellate hairs. Male flower at anthesis ca. 4–4.5 × 4–5 mm, the floral cup obconical with minute, pale yellowish stellate hairs, the floral roof distinctly raised, glabrous and drying black, the 4–5 tepals obtuse or triangular and 1–1.5 mm long, glabrous or occasionally with a few stellate hairs, when fresh greenish yellow to creamy white, turning red; stamens 6, often with 4 outer and 2 central ones, fleshy and containing whitish globules (oil cells), the outer stamens distinctly exserted at anthesis. Female flowers at anthesis of the same size and shape as the males but the floral roof centrally conspicuously raised; the styles 20–30, free. Fruit fleshy, 1.5 × 1.5 cm (when fresh to 2 cm diam.), when immature green with pink spots, when mature light red and with a strong lemon smell when crushed, glabrescent; the 20–30 seeds distinctly visible in dried fruits, verrucose, gray and with a red aril when fresh.

*Distribution, habitat, and phenology.* On the eastern Andean slopes from Putumayo and Caquetá in Colombia to Napo, Pastaza, Morona–Santiago, and Zamora–Chinchipe in Ecuador (and expected in Loja); usually collected in disturbed terra firme forest from 300 to 2000 m altitude; in Ecuador flowering and fruiting year-round.

*Siparuna harlingii* can only be confused with *S. aspera* from which it differs especially in the fruit and pedicels, which in fruit remain slender in *S. harlingii* and become fleshy and almost part of the fruit in *S. aspera*. The two also differ in pubescence, *S. harlingii* having generally much shorter hairs, and in the leaf venation, *S. harlingii* having (8–)12–13(–15) lateral nerves, *S. aspera* (15–)16–20(–26). Finally, the two may be distinguished by the number of styles (20–30 in *S. harlingii* vs. (10–)12–15(–18) in *S. aspera*).

As is the case with several species of *Siparuna*, the crushed leaves of this plant are rubbed on the body by the Quichua Indians in Ecuador to cure "mal aire," a general term used for various diseases of the nervous system and stomach. The Quichua name of the species is "Malaire panga," panga meaning leaf (*Neill & Palacios 6993*).

*Paratypes.* ECUADOR. **Zamora–Chinchipe:** horse-trail Guadalupe–San José de Yacuambi, along Río Yacuambi, potreros and riverside woods, *Harling & Andersson 13937* (AAU, GB). **Tungurahua:** between Baños and Río Verde, *Acosta-Solís 10267* (F); Río Topo, *Harling et al. 10073* (AAU, GB); 30 km on rd. from Mera towards Baños, *Lawesson et al. 43293* (AAU, QCA); Río Margaritas, *Penland & Summers 141* (F, GH, NY). **Napo:** Tena, *Asplund 8938* (QCA, S); Tena, rd. to Archidona, *Harling 3660* (S); Mission Shandia, Jatun Yaku River, *Barclay 4932* (COL); Puerto Napo, *Bénoist 4757* (P); Puerto Napo, path to Latas, *Harling 3537* (S), *Cerón & Iguago 5518* (AAU, QCNE); 8 km downriver from Misahuallí, *Neill & Palacios 6993* (AAU, F, MO, QCNE); km 32–35 Puyo–Tena rd., *Jørgensen et al. 61248* (AAU, QCA); Zatzayacu, *Mexía 7097* (NY, UC, US). **Pastaza:** Mera, *Asplund 18357* (S), *Harling et al. 7807* (AAU, GB), *7840* (AAU, GB). **Morona–**

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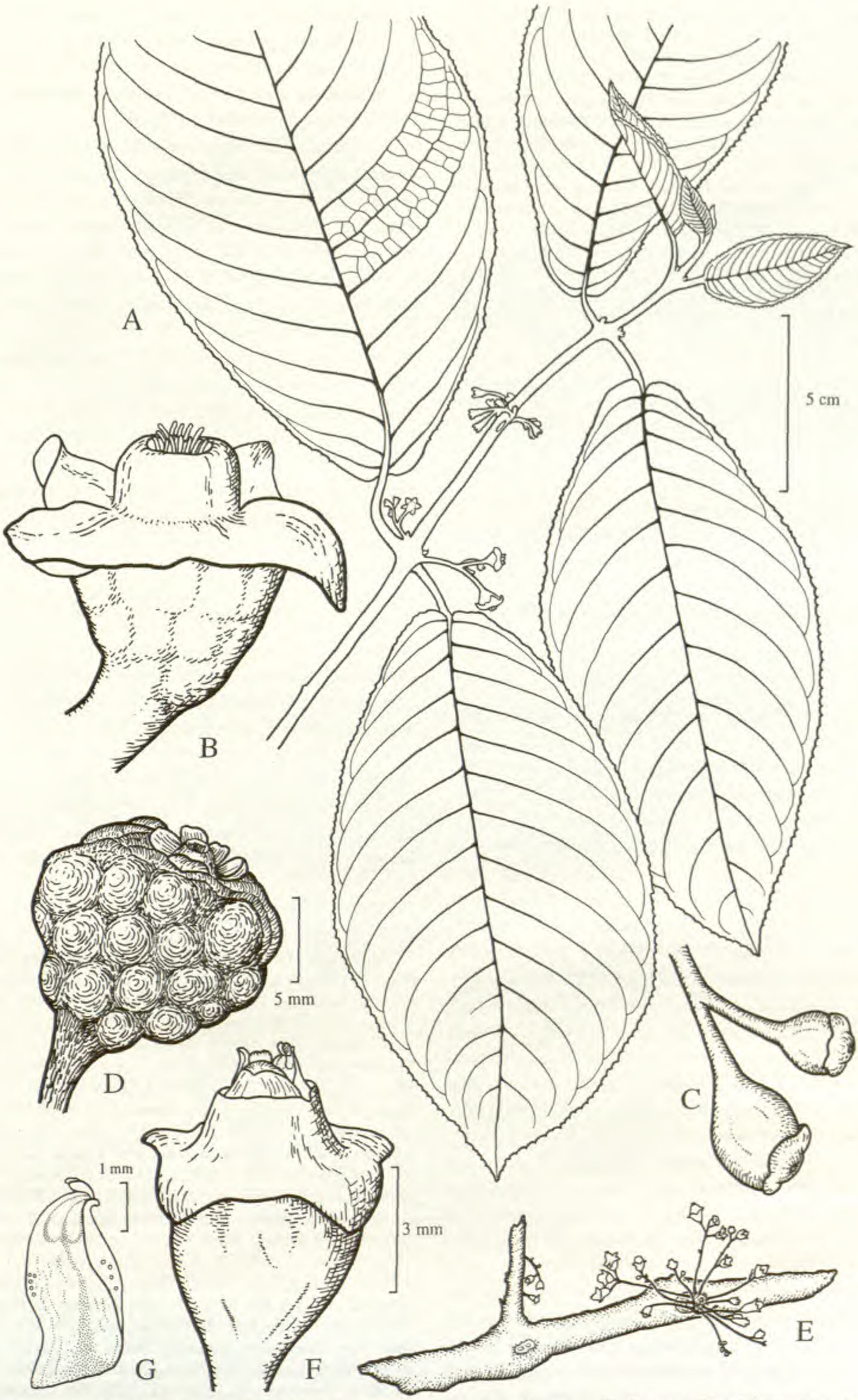
Figure 4. *Siparuna harlingii* Renner & Hausner (A, *Harling 928*; B, *Cuatrecasas 11167*; C, *Harling & Andersson 13937*; D, *Neill & Palacios 6993*; E–G, *Harling & Andersson 13917*). —A. Habit. —B. Female flower. —C.




Young fruits. —D. Mature fruit. —E. Male inflorescence. —F. Male flower. —G. Stamen. The following parts share the same magnification: A, E; B, F; and C, D.

**Santiago:** rd. Limón–Macas, 96 km NE of Limón, *Bohlin et al. 1477* (GB, QCA); near Méndez, *Camp E-851* (NY, S), *Harling 928* (S); Méndez–Limón rd., ca. 3.2 km S of turnoff to Méndez, *Dorr & Valdespino 6345* (AAU, NY, QCA, QCNE); Río Tutanangosa, rd. Sucúa–Huarani, *Holm-Nielsen 20508* (AAU). **Zamora–Chinchipe:** rd. Zamora–Zumba, km 5–12, *Harling & Andersson 13917* (AAU, GB); 10 km S of Zamora on rd. along left shore of Río Jamboé, *Harling & Andersson 24014* (AAU, GB, QCA); rd. La Saquea–Yacuambi, 1 km N of Chapintza, *Harling & Andersson 23893* (AAU, GB, QCA); Zamora, *Harling 5930* (NY, S), *Knight 713* (S); Cumbaratza, *Jaramillo & Winnerskjold 5922* (NY, QCA). COLOMBIA. **Putumayo:** Río Guamués, San Antonio del Guamués, *Cuatrecasas 11167* (F, US); Mocoa, *Cuatrecasas 11278* (F, US), *Schultes 2031* (F, K, US), *Schultes & Cabrera 19064* (US); Río Mocoa drainage at San Antonio, *Ewan 16704* (US); Puerto Umbría, *Klug 1764* (BM, F, K, MO, NY, S, US); near Río Putumayo, *Soejarto et al. 1277* (US). **Caquetá:** 62 km SE of Guadalupe, along rd. to Florencia, *Davidse et al. 5633* (COL, NY).

**Siparuna gigantotepala** Renner & Hausner, sp. nov. TYPE: Ecuador. Carchi: San Marcos valley, 600 m, 20 Nov. 1983 (male, fl), *A. Barfod, L. P. Kvist & D. Nissen 48903* (holotype, QCA; isotype, AAU). Figures 1E–I, 5.

*Siparuna subscandens* A. C. Smith tepalis longe acutatis (2–3 mm) conspicuis distinguenda.

Dioecious shrub or treelet, 2–3(–5) m tall, branchlets densely covered with minute sessile stellate hairs, quadrangular and slightly sulcate. Leaves opposite, the petioles 2.5–4.5 cm long; the lamina drying umber, chartaceous, obovate, 18.5–33 × 8.5–14 cm, the base cuneate to acute, the apex cuspidate with the tip (1–)1.5–2(–3) cm long, both surfaces densely covered with minute stellate hairs, with 9–10(–13) pairs of secondary veins, veins to the third order slightly raised above and distinctly raised below, the margin doubly serrate or subentire. Cymes of both sexes axillary in pairs and multiflorous (less so in the females), 1.5–5(–9) cm long, densely covered with minute stellate hairs. Male flower at anthesis ca. 2.8–3.2 × 2.5–3 mm, the floral cup obconic with stellate sessile hairs, a few of these also on the inside of the tepals and the floral roof, the floral roof distinctly raised, the (4–)5–6 tepals oblong and 2–3 mm long, when fresh greenish cream or white; stamens 4–5(–6), the outer ones somewhat exserted at anthesis. Female flowers at anthesis of the same size and shape as the males but the velum distinctly raised to a central tube surrounding the style bases; the styles 5–8, free. Fruit fleshy, ca. 1.3–2 × 1–2 cm, subglobose and crowned by the persistent tepals, when mature red or purple with whitish spots and strongly lemon-scented; the ca. 5–8 seeds verrucose, gray and with a red aril when fresh.

*Distribution, habitat, and phenology.* Collected in very humid primary pluvial forests in Pacific Colombia and Ecuador at elevations of 20–1500 m; in Esmeraldas and Carchi collected flowering and fruiting from November to April.

*Siparuna gigantotepala* differs from all other Andean species in the elongate, oblong tepals that persist in fruit. A few specimens of *S. gigantotepala* (e.g., *Forero et al. 6740*) possess small domatia at the leaf bases. In this they resemble the western Ecuadorean *S. eggersii* Hieronymus, the western Colombian *S. subscandens* A. C. Smith, and the Panamanian *S. domatiata* A. H. Gentry. All three differ from *S. gigantotepala* in lacking elongate tepals. *Siparuna eggersii* also has smaller, paler green-drying leaves that lack the pronounced drip tip of *S. gigantotepala*, *S. subscandens* has narrower leaves, and *S. domatiata* has much larger domatia (as far as known) than *S. gigantotepala*. There is one Amazonian species, *S. macrotepala* Perkins, which has similarly conspicuous tepals. It differs in pubescence (simple hairs in *S. macrotepala* vs. stellate hairs in *S. gigantotepala*), number of secondary veins in the leaves (5–6(–8) in the first vs. 9–10(–13) in the second), and number of styles (9–12 in the first vs. 5–8 in the second). Moreover, *S. gigantotepala* has free styles, while those of *S. macrotepala* are united into a tube.

The Coaiquer (Awá) Indians inhale the penetrating smell of the fruits and leaves of *S. gigantotepala* to clear the nasal passages (*A. Barfod et al. 48903*). The local names "Limón de monte" or "Diablo de monte limón" also refer to the strong smell of the fruits.

*Paratypes.* ECUADOR. **Esmeraldas:** Eloy Alfaro, Reserva Cotacachi–Cayapas, Parroquia Luis Vargas Torres, Río Santiago, *Tirado et al. 804* (QCNE); trail to Río Mataje Awá encampment from Río Palaví, *Hoover et al. 4007* (AAU, MO, QCA); Reserva Awá, 25 km NW of El Chical, Municipio Maldonado, *Rubio et al. 999* (AAU, MO, QCNE), *Rubio et al. 1036* (AAU, MJG, MO, QCNE); Reserva Awá, Mataje, *Jørgensen et al. 65316* (AAU, QCA), *Rubio & Quelal 1356* (AAU, MJG, MO, QCNE). **Carchi:** Reserva Forestal Awá, trail Gualpí bajo–Tarabita, *Jørgensen et al. 65232* (AAU, QCA); Gaulpi Chico, Awá encampment, *Hoover et al. 2602* (AAU, MO, QCA); Reserva Awá, Centro San Marcos, *Méndez et al. 162* (QCNE); wet plateau above San Marcos de los Coaiqueres, *Øllgaard et al. 57274* (AAU, QCA), *Øllgaard et al. 57584* (AAU, QCA). COLOMBIA. **Chocó:** Quibdó–Tutunendo rd., 14 km E of Quibdó, *Gentry & Rentería 24139* (MO); San José de Palmar, hoya del Río Torito, finca Los Guaduales, quebrada Santa Fe, *Forero et al. 6740* (MO). **Valle:** Río Naya, Puerto Merizaldo, Costa Pacífica, *Cuatrecasas 13964* (F, US); Río Yurumanguí, *Cuatrecasas 15746* (F, US); Río Calima, ca. 10 km N Buenaventura, *Gentry 35263* (COL, MO). **Nariño:** Municipio de Tumaco, *Mora 4212* (COL).

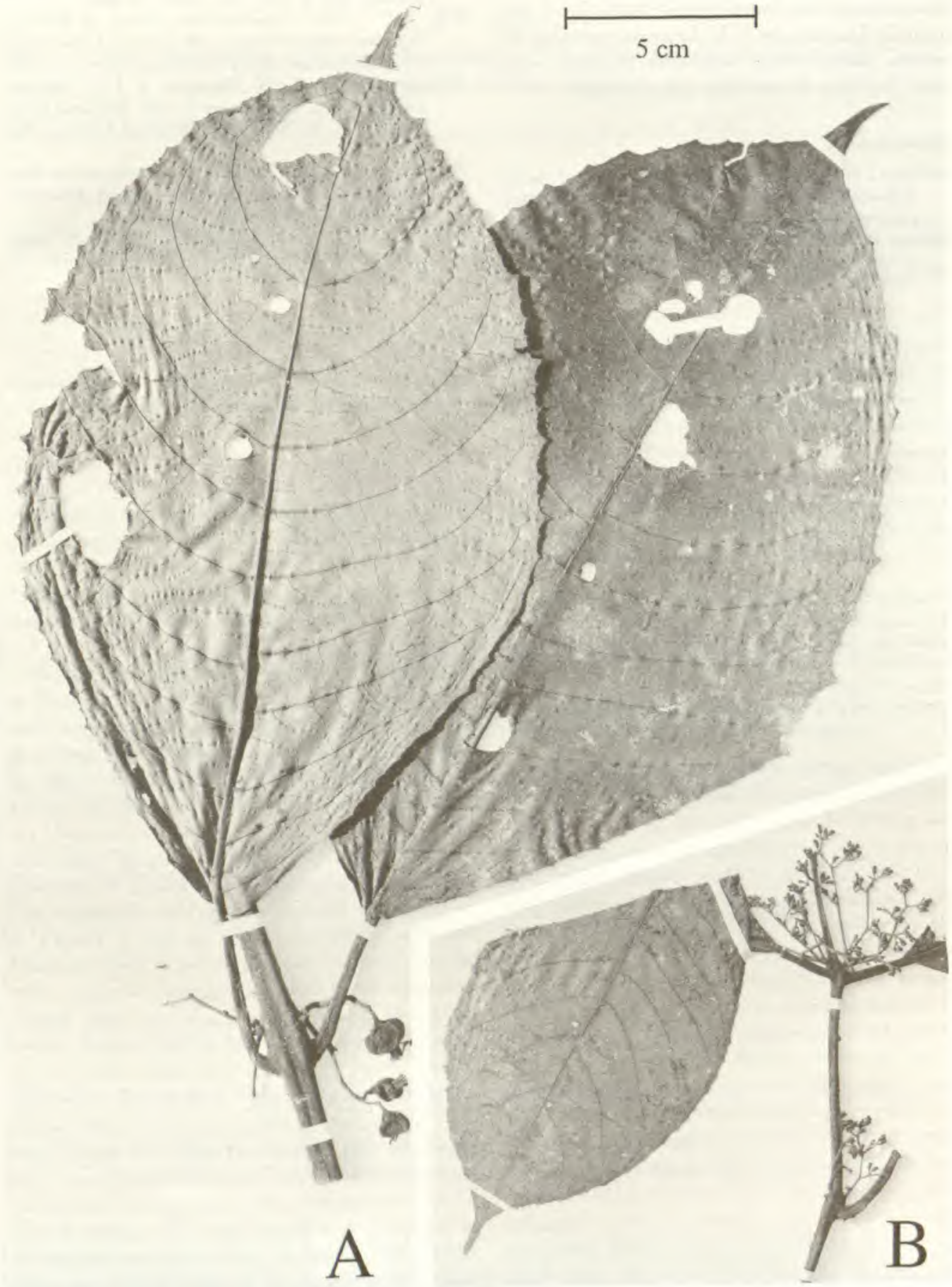



Figure 5. Female specimens of *Siparuna gigantotepala* Renner & Hausner. —A. *Øllgaard et al. 57274*. —B. *Barfod et al. 48903*, AAU isotype.

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Literature Cited

Dodson, C. H. & A. H. Gentry. 1978. Flora of the Río Palenque Science Center. Selbyana 4: 1–628 [Monimiaceae, pp. 434–436].

Endress, P. K. 1980. Ontogeny, function and evolution of extreme floral construction in Monimiaceae. Pl. Syst. Evol. 134: 79–120.

——— & L. D. Hufford. 1989. The diversity of stamen structures and dehiscence patterns among Magnoliidae. Bot. J. Linn. Soc. 100: 45–85.

Feil, J. P. 1992. Reproductive ecology of dioecious *Siparuna* (Monimiaceae) in Ecuador—A case of gall midge pollination. Bot. J. Linn. Soc. 110: 171–203.

Holmgren, P. K., N. H. Holmgren & L. C. Barnett. 1990. Index Herbariorum 1. The Herbaria of the World, Ed. 8. New York Botanical Garden, New York.

Perkins, J. R. 1901. Beiträge zur Kenntnis der Monimiaceae. III. Monographie der Gattung *Siparuna*. Bot. Jahrb. 28: 660–705, t. 12–14.

———. 1911. Monimiaceae. Pp. 1–67 *in* A. Engler (editor), Das Pflanzenreich IV, 101 (Nachträge). W. Engelmann, Leipzig.

# Two Lesquerellas (Cruciferae) of South Central and Western Montana

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ABSTRACT. Two heretofore unknown species of *Lesquerella* are described. These occur in limited areas in the mountains of central and western Montana. Both species, here named *L. lesicii* and *L. pulchella*, occur in patches of limestone-derived soils and rubble that are conspicuously barren of trees and shrubs and other types of plant cover, or on the borders of such areas where the limestone detritus meets soils and rubble of crystalline rocks. Also, they are often found in open areas in sparse stands of low-growing trees or shrubs.

Recent samplings of populations of *Lesquerella* in Montana show that species diversity in this genus goes somewhat beyond that previously recognized in monographic treatments (Payson, 1922; Rollins & Shaw, 1973; Rollins, 1993). What has been known for the area is that species of *Lesquerella* are often abundant and are an important component of the flora of specialized habitats, especially where limestone or derivatives of limestone are involved. The nature of some of these habitats is well shown in Figures 1 and 2, where the highly reflective limestone-derived soil and rubble contrast with the more vegetated surrounding areas. These windswept whitish areas are the places where *L. pulchella* grows. Also known is that a high degree of complexity exists within some species, such as *L. alpina* (Nuttall ex Torrey & A. Gray) S. Watson, which is frequently encountered in the general region. But now we see that there are existing taxa not previously recognized, and these have complicated relationships with species south of Montana in Idaho and Wyoming. The main purpose of this paper is to describe two new species of *Lesquerella* and explain their relationships to previously known taxa. It is somewhat ironic that I had only recently (Rollins, 1993) completed a review of *Lesquerella* as it occurs in North America when these two species showed up too late to be included in my treatment.

**Lesquerella lesicii** Rollins, sp. nov. TYPE: U.S.A. Montana: abundant in gravelly limestone-derived soil at edge of limber pine woodland on the ridge W of Layout Creek, ½ mi. S of Mystery Cave, Pryor Mountains, Carbon County, 7500 ft., T85, R28 E, S21, SW ¼, with *Shoshonea pulvinata*, *Astragalus aretoides*, and *A. miser*, 20 June 1992, *Peter Lesica 5707 and Rob DeVelica* (holotype, GH).

Herba perennis, caudicibus simplicibus, folia basibus erectis dense stellatis argenteis 0.5–1 cm longis, caulis erectis vel decumbentibus gracilibus 1–1.5 dm longis, petalis aureis spathulatis vel lingulatis 6–7 mm longis, pedicellis fructiferis recurvatis vel divaricatis 5–10 mm longis, siliquis globosis vel subglobosis 3–4 mm diametro pilis stellatis adspersus, loculis 3–5 ovulatis.

Delicate perennial; caudex simple, sometimes elongated and with old leaf bases; basal leaves erect, usually fewer than 10, entire, 1.5–3 cm long, petioles slender, abruptly expanded to blade, 1–2.5 cm long, blades broadly ovate to elliptical, 0.5–1 cm long, silvery from a dense cover of stellate trichomes; leaf trichomes small, ca. 0.02 mm diam., ray tips 15–25, each primary ray forked near its base; flowering stems very slender, mostly filiform, simple, erect to decumbent, 1–1.5 dm long; cauline leaves few, remote, ± spatulate, lower somewhat petiolate, upper cuneate at base; inflorescences lax, rarely nodding, usually with fewer than 10 flowers; sepals erect, densely pubescent, oblong, nonsaccate and without scarious margins, 3.5–4 mm long; petals yellow, often fading to light purple toward their tips, spatulate to nearly lingulate, 6–7 mm long; stamens strongly tetradynymous; infructescences lax, greatly elongated; fruiting pedicels filiform, recurved in a single arch to widely spreading, 5–10 mm long; siliques globose or subglobose, spreading at right angles to rachis to pendent, 3–4 mm diam., ± densely pubescent on exterior, valves glabrous on the interior; styles ca. 1.5 mm long, glabrous or

with a few trichomes near their bases; ovules 3–5 per locule; mature seeds not seen.

*Lesquerella lesicii* is most closely related to *L. fremontii* Rollins & E. Shaw. Both species are apparently endemic to very limited areas and appear to be restricted to Madison limestone derivatives. *Lesquerella lesicii* occurs in the Pryor Mountains of Montana, which are northwest of the Big Horn Mountains and separated from that range by the canyon of the Big Horn River. *Lesquerella fremontii* is found at the southeastern end of the Wind River range in Wyoming. These areas are about 200 miles apart. The two species are singular in having small unbranched caudices (although definitely perennial), erect basal leaves, simple flowering stems, more or less recurved fruiting pedicels, and globose siliques. Both species have small, stellate, many-rayed trichomes and weak stems, which are particularly fragile in *L. lesicii*.

*Lesquerella lesicii* differs from *L. fremontii* in having basal leaves with very thin petioles that abruptly expand to a broadly ovate to orbicular blade, whereas in *L. fremontii* the petioles are stouter and expand gradually to a spatulate or nearly linear blade. The flowering stems of *L. fremontii* are horizontal along the ground and the infructescences are secund. In *L. lesicii* these stems are erect and the infructescences have the usual racemose pattern. The fruiting pedicels are definitely recurved in a single arch and the siliques are more or less pendent in *L. fremontii*, but in *L. lesicii* the pedicels, although tending to be recurved, are more often just slightly arched and are widely spreading, bearing siliques that are horizontal. The pedicels are so finely filiform that they are extremely fragile, while those of *L. fremontii* are thicker and much less fragile.

According to Peter Lesica (in litt.), *Lesquerella lesicii* is not the only endemic species that occurs in the Pryor Mountains. He points out that *Penstemon caryi* Pennell and *Erigeron allocotus* Blake are endemic there and that the recently described monotypic *Shoshonea pulvinata* Evert & Constance is restricted to Madison limestone in the Pryors, and along the front of the Beartooth, Absaroka, and Owl Creek mountains in Wyoming and Montana.

*Paratypes.* U.S.A. **Montana:** Carbon County, very common in gravelly limestone derived soil on a NE-facing slope at the head of Big Coulee, Pryor Mtns., 6400 ft., T9S, R28E, NE ¼, with *Cercocarpus ledifolius*, *Musineon vaginatus*, and *Agropyron spicatum*, 19 June 1992, *Peter Lesica 5700 and Rob DeVelice* (GH, MONTU); locally abundant in stony limestone derived soil in a windswept Douglas Fir forest on a ridge ca. ½ mi. S of Mystery Cave, Pryor Mtns., 7500 ft., T8S, R28E, Sec. 21, SW ¼, with *Hymenoxys torreyana* and *Eritrichium howardii*, 27 June 1991, *Peter Lesica 5449* (GH, MONTU).

**Lesquerella pulchella** Rollins, sp. nov. TYPE: U.S.A. Montana: Beaverhead County, common in barren calcareous soil in open spruce woodland on S-facing slope along Trapper Creek just S of Hecha Mines, Pioneer Mtns., T3S R11W, Sec. 32, 8600 ft., with *Potentilla fruticosa* and *Zigadenus elegans*, 25 July 1991, *Peter Lesica 5525 and Steve Cooper* (holotype, GH; isotype, MONTU).

Herba perennis, caudicibus simplicibus, folia radicalibus simplicibus argenteis petiolata 1–2 cm longis laminis late ovatis vel ellipticis, caulis tenuibus prostratis 2–7 cm longis, folia caulina petiolata vel ad basi cuneatis, sepalis oblongis 3–4(–5) mm longis dense pubescentibus, petalis aureis spathulatis vel lingulatis (6–)7–8(–9) mm longis, pedicellis fructiferis plerumque patuleis ± sigmoideis 5–7 mm longis, siliquis orbicularibus vel ellipticis pubescentibus (3–)4–6(–7) mm longis, 3–4 mm latis, stylis 1–1.5 mm longis, loculis 3–5 ovulatis, seminibus oblongis crassis ± 2 mm longis.

Perennial; caudex mostly simple; caudex leaves several to numerous, simple, silvery from a dense cover of appressed radiately branched trichomes, blades broadly ovate or elliptical to wider than long, obtuse, 1–2 cm long including the slender petioles; leaf trichomes in several layers, branches usually forked near their bases, primary branches 6–7; stems several to many, slender, simple or occasionally branched, mostly prostrate, 2–7 cm long; cauline leaves petiolate below to cuneate above, spatulate to narrowly elliptical or broadly ovate; inflorescences congested, flowering pedicels divaricately ascending to nearly erect, straight or nearly so; sepals narrowly oblong, 3–4(–5) mm long, nonsaccate, densely pubescent; petals yellow, spatulate to lingulate, (6–)7–8(–9) mm long; stamens erect, filaments slender, anthers oval; fruiting pedicels divaricately ascending to widely spreading, sigmoid to slightly so or nearly straight, slender, 5–7 mm long, not swollen toward the apex; siliques nearly orbicular to elliptical or broadly oblong, rounded above and below, strongly compressed contrary to the septum but with a definite ridge down the middle formed over the replum edges, densely pubescent but not silvery, (3–)4–6(–7) mm long, 3–4 mm wide; septum entire or with a narrow perforation; styles 1–1.5 mm long, not expanded at summit; seeds plump, oblong, brownish, ca. 2 mm long, wingless, cotyledons accumbent.

*Lesquerella pulchella* (Figs. 3, 4) is most closely related to *L. paysonii* Rollins. Both species have siliques compressed contrary (perpendicular) to the plane of the septum. Their foliage and siliques are

Figures 1 and 2. Typical habitats of *Lesquerella pulchella* Rollins. —1. Upper, East Pioneer range, viewed from subsummit of Black Lion Mountain. —2. Lower, north of Black Lion Mountain, south of Vipond Park. Photos by Peter Lesica.

Figures 3 and 4. *Lesquerella pulchella* Rollins (ca. natural size). —3. Upper, flowering plant (*Lesica 5528*). —4. Lower, fruiting plants (*Lesica 5525*). Photos by Peter Lesica.

covered with relatively small, radiately branched trichomes, and in each species the foliage is silvery from the multiple layers of trichomes present. A single layer of trichomes on the silique surfaces does not produce the same silvery effect. The silique compression is more severe in *L. paysonii* than in *L. pulchella*. The result is that the replum margin does not protrude and the replum itself is narrower in *L. paysonii* than in *L. pulchella*. In the latter, the replum margin does protrude to form a riblike ridge where the valves come together.

Generally in *Lesquerella*, the presence or absence

of trichomes on the interior of the valves is not an infallible mark of distinction between species, but most of the specimens of *Lesquerella pulchella* I have examined do have trichomes on the valve interior. On the other hand, none of the specimens of *L. paysonii* I have seen have trichomes there. This is worth noting because it may turn out to be a significant difference once enough populations have been sampled to establish the surety of the feature difference. Some variation in the length of the styles is to be expected and does occur in both species. However, this variation ranges from 2 mm in length downward in *L. pulchella*, but from 2 mm upward to 4 mm in *L. paysonii*.

There is a basic difference in the outline shape of the siliques of *Lesquerella paysonii* and *L. pulchella*. In the latter, the siliques are nearly orbicular in outline or only slightly longer than broad, while in *L. paysonii* the siliques are definitely longer than broad, usually nearly twice as long as wide. The effect of this pattern, combined with the degree of compression on the shape and length of the replum, is seen in the differences of the replum shape in the two species. The replum of *L. paysonii* is longer, narrower, and tapers more gradually toward the apex than in that of *L. pulchella*, where the replum tends toward a more oblong shape. In *L. pulchella* the valve margins are tightly pressed together so that the replum margin does not show and there is a continuous cover of trichomes over the ridge formed between the valves. But in *L. paysonii* the valve margins are rarely sufficiently together to touch each other. Here the replum margins show a break between the valves, and the trichome cover is not continuous from one valve to the other.

*Lesquerella pulchella* ranges in elevation from around 6300 to about 9600 feet. As with other plant species with such a wide elevational occurrence, there is considerable variation from population to population. Some of this variation appears to be correlated with elevation, some not. I note that the flowers on the high elevation variants are both larger and more numerous per plant than in the populations of lower elevations. This was called to my attention by Bonnie Heidel.

*Paratypes.* U.S.A. **Montana:** Beaverhead County, common on gentle E-facing slope at the top of Keokirk Mt., near contact between crystalline and calcareous parent materials, T3S, R11W, Sec. 10, 9600 ft., 25 July 1991, *Peter Lesica 5528 and Steve Cooper* (GH, MONTU); common in portion of upper S-facing slope on ridge point, S of Bridger Pass, T7S, R11W, Sec. 27, 7140 ft., 5 Aug. 1992, *B. Heidel 938* (GH); common in barren calcareous soil on a moderate E-facing slope of the ridge N of Black Lion Mt., T2S, R11W, Sec. 29, 9200 ft., 24 July 1991, *Peter Lesica 5522 and Steve Cooper* (GH, MONTU); steep slopes of upper montane zone, Nemesis Mt., T14S, R2E, Sec. 31, 9050 ft., 27 June 1992, *B. Heidel 722* (GH); near same location, 27 June 1992, *B. Heidel 721* (GH); above Scudder Creek on ridges at the edge of Pioneer Mtns., T6S, R12W, Sec. 21, 6720 ft., 24 June 1992, *B. Heidel 700* (GH); open scree of S-facing slope, ridge E of Nemesis Mt., T14S, R2E, Sec. 21, 9000 ft., 26 July 1992, *Lisa Schassberger Roe 493 and Jonathan Stewart Roe* (GH).

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Literature Cited

Payson, E. B. 1922. A monograph of the genus *Lesquerella*. Ann. Missouri Bot Gard. 8: 103–236.

Rollins, R. C. 1993. The Cruciferae of Continental North America. Stanford Univ. Press, Stanford, California.

——— & E. A. Shaw. 1973. The Genus *Lesquerella* (Cruciferae) in North America. Harvard Univ. Press, Cambridge, Massachusetts.

# *Merostachys multiramea* (Poaceae: Bambusoideae: Bambuseae) and Similar Species from Brazil

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ABSTRACT. The true identity of *Merostachys multiramea* Hackel is discussed. As a result of a review of the group of the species similar to *M. multiramea*, the following are described as new: *Merostachys abadiana*, *M. caucaiana*, *M. filgueirasii*, *M. kleinii*, *M. magellanica*, *M. pilifera*, *M. scandens*, and *M. skvortzovii*. The description of floral morphology is added to *M. glauca* McClure & L. B. Smith, which was originally described from sterile material. A key to the species is provided. All the species are fully illustrated.

In the past the name *Merostachys multiramea* Hackel has been applied erroneously to a number of different species, both described and undescribed. Because true *M. multiramea* is a distinct and rather rare species, represented in herbaria by only a few collections, a considerable amount of misidentified material has been placed under the specific epithet *multiramea* and thus left unstudied. Among these are species that present no difficulties in identification: either they are clearly new or they have already been described. However, there is a group of about 10 species that are difficult to distinguish one from another, but which cannot be aggregated under one name as has so far been the case.

As botanists working with herbarium collections of Brazilian bamboos have tended, over the years, to assign almost any specimen of *Merostachys* with medium-sized, 1- or occasionally 2-flowered spikelets to *M. multiramea* Hackel, the misidentification has had fourfold results. A number of validly published species, including *M. argyronema* Lindman, *M. claussenii* Munro, and *M. clausenii* Munro var. *mollior* Doell, were for a long time disregarded in the belief that they were all *M. multiramea*. Two names, *M. anomala* Dutra and *M. burchellii* Munro *emend.* Dutra (not *M. burchelii* Munro), crept into the group. Collections that would later be considered as distinct though unpublished taxa (*M. magellanica*, for instance) went unrecognized. And the identity of *M. multiramea* itself, the "umbrella" for so many other taxa, was largely obscured.

The name *Merostachys multiramea* was published in 1909 by Hackel, and *M. claussenii* Munro var. *mollior* by Doell in 1880 (see von Martius, 1840–1906). The two species were described again, under new names, by Dutra in 1938: the former as *M. anomala* Dutra and the latter as *M. burchellii* Munro *emend.* Dutra. Dutra's emendation was based on the assumption that unidentified collections of flowering material in his possession were a good match for the vegetative and sterile material on which Munro (1868) based his original description. This "graft" was published by him (Dutra, 1938) as a distinct species.

The situation was further complicated by the inversion of the captions to Dutra's figures: his figure 2 (Dutra, 1938: 149), purporting to show leaves and inflorescences of *M. burchellii* Munro *emend.* Dutra, is, in fact, of *M. anomala* (= *M. multiramea*), while his figure 3 (Dutra, 1938: 149), which claims to be of *M. anomala*, is of *M. burchellii* Munro *emend.* Dutra (= *M. claussenii* Munro var. *mollior* Doell).

Return of the captions to their rightful figures eliminates a misleading interpretation of inflorescence and spikelet morphology in the two taxa concerned, and permits their proper identification as synonyms of previously published species. In this context, *M. multiramea* also assumes its true identity, as a rare bamboo from the southern part of Brazil; Dutra's figure 2 makes it clear that it is not one of the group of rather common species with only one floret in the spikelet. *Merostachys multiramea* Hackel is characterized by a 2-flowered spikelet and by its dark brown (nearly black), conical caryopses. Both florets are fertile—the rudimentary apical floret and the upper and lower glumes, called "florets" by authors of the last century, obviously not included. Thus, far from being widely distributed, *M. multiramea* has been collected only infrequently, and mostly by Dutra, under the name *M. anomala*.

KEY TO THE SPECIES OF *MEROSTACHYS* SIMILAR TO *M. MULTIRAMEA*

1. Culm internodes densely pilose, hairs sericeous, translucent, ca. 1 mm long, in some areas sharp, globose prickle hairs also present ..... *M. pilifera*
1. Culm internodes glabrous, smooth or scabrous, with prickle hairs or mottled with dark spots and stripes ..... 2

2(1). Spikelets always 2-flowered or occasionally 2-flowered (both florets fertile), otherwise bearing different stages of development of the upper floret ..... 3
2. Spikelets always 1-flowered ..... 5
3(2). Spikelets always 2-flowered ..... 4
3. Spikelets occasionally 2-flowered (both florets fertile), otherwise bearing different stages of development of the upper floret; florets ca. 9 mm long, caryopsis ellipsoid, 6 mm long, 1.5 mm wide ..... *M. caucaiana*
4(3). Florets 7–9 mm long, 3 mm wide, laterally strongly compressed, imbricate; caryopsis conical, attenuate at the apex, dark brown (nearly black), 6–7 mm long, 3 mm wide ..... *M. multiramea* Hackel
4. Florets ca. 10–12 mm long; caryopsis broadly ovoid, basally and apically rounded, dark yellow, 6–7 mm long, 4–4.5 mm wide ..... *M. kleinii*
5(2). Spikelets always with two parallel, longitudinal, white lines, formed by the keels of the palea ..... *M. magellanica*
5. Spikelets without parallel, white lines ..... 6
6(5). Caryopsis ovoid ..... 7
6. Caryopsis ellipsoid, 7.5 mm long, 3 mm wide, grayish brown, culm leaf blades narrow, 4–5 cm long, 4 mm wide, branch leaf blades lanceolate, 4–9 cm long, 8–12 mm wide, L:W = 5–7.5 ..... *M. filgueirasii*
7(6). Branch leaf blades lanceolate, 3–11 cm long, 6–16 mm wide, L:W = 5–6.9 or 3.5–10 cm long, 8–14 mm wide, L:W = 4.4–7.1; branch complements with 40–200 branches ..... 8
7. Branch leaf blades broadly lanceolate, 4–12 cm long, 15–20 mm wide, L:W = 2.6–6 or narrowly linear-lanceolate, 5–13 cm long, 6–12(–17) mm wide, L:W = 8.3–10.8; branch complements with 20–60 branches ..... 9
8(7). Branch complement with 150–200 branches; branch leaf blades lanceolate, 3–11 cm long, 6–16 mm wide, L:W = 5–6.8; culm leaf blades lanceolate, 6–10 cm long, 10 mm wide; inflorescences pectinate; caryopsis 5 mm long, ca. 3 mm wide, apically rounded ..... *M. skvortzovii*
8. Branch complement with 40–60(–100) branches; branch leaf blades lanceolate, 3.5–10 cm long, 8–14 mm wide, L:W = 4.4–7.1, culm leaf blades lanceolate, 8–12 cm long, 4–5 mm wide; inflorescence distichously arranged, caryopsis 5.5–6.5 mm long, ca. 3 mm wide, slightly attenuate apically ..... *M. scandens*
9(7). Branch leaf blades broadly lanceolate, 4–12 cm long, 1.5–2 cm wide, L:W = 2.6–6; lemma finely puberulent ..... *M. abadiana*
9. Branch leaf blades narrowly linear-lanceolate, 5–13 cm long, 6–12(–17) mm wide, L:W = 8.3–10.8, lemma pilose, the hairs ca. 0.5 mm long, silver-grayish ..... *M. glauca* McClure & L. B. Smith

**Merostachys abadiana** Sendulsky, sp. nov. TYPE: Brazil. Estado de São Paulo: Município Itatinga, Abadia, 26 sep. 1978 (fl), *Campos Neto s.n.* (holotype, SP 154498). Figure 1.

Culmi ca. 2 m longi. Fragmenta ad extremitates culmorum internodium 2–5 mm diametro, laevia. Nodi prominentes, crista supranodali angusta, tubiformi. Folia culmorum ignota. Rami in complemento 20–30. Foliorum ramorum laminae late lanceolatae, 4–12 cm longae, 1.5–2 cm latae. Inflorescentia speciformis, pectinata, 2–4 cm longa. Spiculae 11–13 mm longae, late ellipticae, 1-flosculatae; gluma infera 3 mm longa; gluma superior 8.5 mm longa, 11–13-nervia, acuta; lemma 9 mm longum, 15–16-nervium, late lanceolatum, puberulum; palea fusiformis, 9 mm longa, 10-nervia, anguste sulcata. Caryopsis ovoidea, 4.5 mm longa, 3.4 mm lata, cinereo-lutea.

Woody bamboo ca. 2 m high, according to collector's note. Fragments of internodes from tip of the culm fistulose, 2–5 mm diam., yellowish, smooth. Nodes salient, supranodal ridge narrow, tubiform. Culm leaves not seen. Branch complement with 20–30 branches, these 8–40 cm long, 1 mm thick, glabrous, 1–2-noded before the leaves. Branch leaves of the flowering branches 4–5 per complement: sheaths tight, finely puberulent, the overlapping margin glabrous; adaxial surface dark-spotted; oral setae 2–3 mm long, distally crisped; pseudopetiole grayish yellow, 2 mm long, finely pubescent; inner ligule a thick membrane, pubescent on the back; outer ligule a slightly pubescent rim; blades 4–12 cm long, 1.5–2 cm wide, L:W = 2.6–6, broadly lanceolate, glabrous adaxially except for a scabrous base, with rows of fine prickle hairs and 2–3 marginal nerves toward the apex with fine prickle hairs, slightly pubescent abaxially, more densely so at the base, the hairs whitish, margins glabrous or finely scabrous toward the apex. Inflorescences terminal on leafy branches, spikelike, pectinate, 2–4 cm long, with 4–15 spikelets. Rachis densely pubescent. Pedicels pubescent, short. Spikelets solitary, 1-flowered, bisexual, broadly ellipsoid, somewhat inflated, 11–13 mm long, 3–4 mm wide. Glumes 2, unequal. Lower glume 1-nerved, carinate, attenuate toward the apex, finely puberulent, 3 mm long, 1 mm wide at the base. Upper glume 8.5 mm long, 3.5 mm wide, broadly lanceolate, acute, awnless, finely puberulent, 11–13-nerved, adaxially shiny, dark-spotted. Lemma 9 mm long, 6 mm wide, very broadly lanceolate, deeply concave, enclosing a palea, 15–16-nerved, finely puberulent abaxially, the adaxial surface dark brown, shiny, densely spotted, the margins densely ciliate, the hairs dark, reddish. Palea fusiform, 9 mm long, 5 mm wide, 2-keeled, narrowly sulcate abaxially, 10-nerved, the nerves densely anastomosing, the veinlets uneven; the keels finely ciliate; abaxial surface densely puberulent at the apex and along the sulcus, glabrous in the lower part; adaxial surface shiny, dark. Rachilla extension bristle-like, with a small rudiment on the tip. Caryopsis 4.5 mm long, 3.4 mm wide, ovoid, rostrate,

Figure 1. *Merostachys abadiana* Sendulsky. —a. Branch complements from the upper part of the culm. —b. Apical part of the inflorescence. —c. Spikelet. —d. Caryopsis, lateral view. —e. Caryopsis, embryo view. —f. Lower glume. —g. Upper glume. —h. Lemma. —i. Palea. —j. Caryopsis, hilum view. —k. Upper portion of the branch leaf sheath and base of the blade (abaxial surface). Based on *Campos Neto s.n.* (SP 154498).

grayish yellow, the embryo and the hilum scarcely manifest externally.

*Phenology*. Known only from the type collection.

*Distribution*. Known only from the type locality, in the State of São Paulo, Brazil.

*Merostachys abadiana* was collected on the grounds of a Benedictine abbey in São Paulo in 1978 and sent to the Instituto de Botânica, São Paulo, for identification. No further information about the plant was obtained, except that some clumps of

Figure 2. *Merostachys caucaiana* Sendulsky. —a. Flowering branch complement. —b. Spikelet, lower floret with mature caryopsis, upper floret not fully developed. —c. Spikelets with two fertile florets. —d, e. Spikelets in different stages of development (upper florets). —f. Lodicules. —g. Caryopsis, embryo view. —h. Inflorescence. —i. Caryopsis, lateral view. —j. Caryopsis, hilum view. —k. Upper portion of the branch leaf sheath and base of the blade (abaxial surface). —l. Lower glume. —m. Upper glume. —n. Lemma. —o. Palea. —p. Palea and rachilla extension with underdeveloped upper floret. Based on *O. Handro & Menezes s.n.* (SP 262720).

the bamboos are still growing in that area. It is somewhat similar to *M. pilifera* (described later in this paper) in the morphology of the spikelet and details of the lemma but differs in the glabrous internodes and in the wider branched leaf blades, which are hairy on the abaxial surface.

**Merostachys caucaiana** Sendulsky, sp. nov. TYPE: Brazil. Estado de São Paulo: Município de Cotia, Caucaia, 1978 (fl), *O. Handro & Menezes s.n.* (holotype, SP 262720). Figure 2.

Habitus ignotus. Fragmenta ad extremitates culmorum internodium fistulosa, laevia, opaca, maculis atro-viridibus rotundatis. Nodi pilis albis, retrorsis ad basin. Folia culmorum ignotae. Rami in complemento 40–50. Foliorum ramorum laminae lanceolatae, 2–7 cm longae, 5–12 mm latae. Inflorescentia spiciformis, pectinata, 2–3 cm longa, ramum foliorum terminans. Spiculae 1 aut rare 2-flosculatae, 9–10 mm longae, fusiformes, lateraliter compressae; flosculus inferior bisexualis, 9–10 mm longus vel rudimentalis. Gluma inferior 2 mm longa; gluma superior 7 mm longa, 9–11-nervia; lemma 7 mm longum, 9-nervium; palea 7 mm longa, late sulcata. Caryopsis elliptica, 6 mm longa, pallide brunnea.

Habit unknown. Fragments of the culm internodes from the tip of the culm delicate, with thin pendent or clambering tips. Internodes fistulose, ca. 1 cm diam., glabrous, smooth, but not lustrous, opaque, finely mottled with very small, dark green, rounded spots (not stripes) and with a glaucous-whitish touch toward the upper part. Upper culms sometimes rugose with small, sharp, retrorse prickle hairs. Culm walls 1 mm thick. Nodes salient with white retrorse hairs below. Culm leaves not seen. Branch complement (upper portion of plant) with 40–50 branches, these 10–15 cm long, 1 mm thick, glabrous, 1–2-noded before the leaves. Branch leaves 3–4 per complement: sheaths tight, glabrous, adaxially dark-spotted, the overlapping margin finely ciliate or glabrous, the intercostal zone finely transversally rugose; oral setae 13–15 cm long, diminishing in size downward, along the margins of the sheath; pseudopetiole dark, rugose, with a few fine prickle hairs at the base adaxially; inner ligule 0.5 mm long; outer ligule a salient rim; blade 2–7 cm long, 5–12 mm wide, L:W = 4–5.8, lanceolate, with an acuminate apex and slightly asymmetrical at the base, glabrous on both surfaces except for the base abaxially, the hairs whitish, hyaline, appressed, on one side of the midnerve; adaxial surface with 2–3 marginal nerves on one side with rows of fine prickle hairs; margins finely scabrous. Inflorescences spikelike, pectinate, 2–3 cm long, half inserted in ultimate sheath. Rachis and pedicels pilose. Spikelets 1- or rarely 2-flowered. Glumes 2, unequal. Lower glume 2 mm long, 1 mm wide, acuminate, carinate, 1-nerved, puberulent, ciliate at the margins. Upper glume 7 mm long, 3 mm wide, broadly lanceolate, 9–11-nerved, finely puberulent, ciliate at the margins, the nerves anastomosing. Lower floret bisexual, 9–10 mm long, 2–3 mm wide, fusiform, laterally compressed. Lemma 7 mm long, 4 mm wide, broadly lanceolate, finely puberulent, 9-nerved, the nerves anastomosing, the margins ciliate. Palea 7 mm long, glabrous, 2-keeled, broadly sulcate between the keels, the sulcus finely pilose, the keels ciliate. Rachilla extension flat, ca. 0.5 mm wide, puberulent and ciliate laterally, bearing one of several different stages of development of the upper floret, these varying in size and shape, from a small rudiment to a fully formed fertile floret, identical to the lower one. Rachilla extension of the upper floret bristle-like, with a small rudiment at the tip. Lodicules 3, 2 mm long, finely ciliate apically. Ovary not seen. Caryopsis 6 mm long, 1.5 mm wide, ellipsoid, rostrate, light brown, shiny, the embryo and the hilum scarcely manifest externally.

*Phenology.* The only available flowering specimen of this species is the holotype.

*Distribution.* Known only from the type locality, in the State of São Paulo, Brazil.

*Merostachys caucaiana* was found growing in a secondary forest in the Municipality of Cotia, ca. 40 km from São Paulo.

**Merostachys filgueirasii** Sendulsky, sp. nov. TYPE: Brazil. Distrito Federal: Catetinho, 15°57′S, 47°59′W, 7 Jan. 1982 (fl), *Filgueiras & Pereira 953* (holotype, IBGE; isotypes, CCN, MG, SP, UEC). Figure 3.

Culmi 2–10 m longi, 1–1.5 cm diametro; internodia fistulosa, scabra. Nodi glabri; crista supranodali tubiformi. Foliorum culmorum laminae angustae, 4–5 cm longae et 4 mm latae. Rami in complemento 20–50. Foliorum ramorum laminae lanceolatae, 4–9 cm longa, 8–12 mm latae. Inflorescentia spiciformis, pectinata, 3.5–4.5 cm longa, ramorum foliarum terminans. Pedicelli pilosi, base dilata in projecturam nudam, globosam. Spiculae 13.5–14 mm longae, fusiformes, 1-flosculatae. Gluma infera 2 mm longa; gluma supera 8–10 mm longa, 7–9-nervia, aristulata; lemma 8–9 mm longum, 21–23-nervium, subtiliter puberulum, ad marginem strigosum, pilis fuscis; palea 11 mm longa, 12-nervia, anguste sulcata. Caryopsis elliptica, 7.5 mm longa, cinereo-brunnea.

Caespitose, woody bamboo, forming dense clumps. Rhizomes pachymorph, sympodial, densely covered by yellow scales. Culms 2–10 m long, 1–1.5 cm diam., flexuous at the tips, according to Filgueiras (1988). Internodes fistulose, scabrous, green when young, yellowish when mature, finely mottled with small, dark green stripes. Culm walls of the middle internodes 1–1.5 mm thick. Nodes glabrous, salient, supranodal ridge tubiform, 1–2 mm long, especially evident in young culms. Culm leaves deciduous: sheaths 12–15 cm long, 5–6 cm wide, rounded at the summit, fringed at the apex with dense tufts of

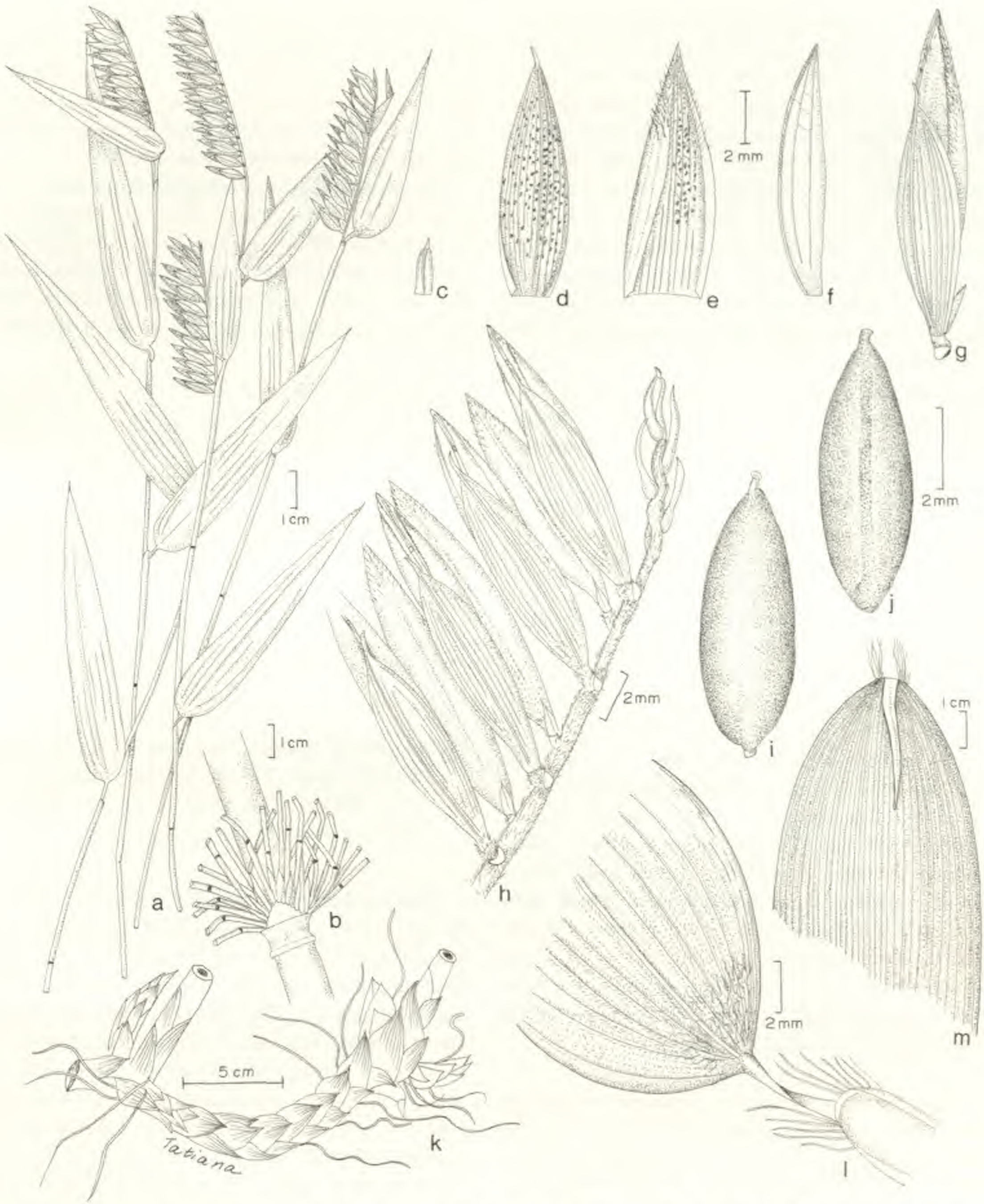


Figure 3. *Merostachys filgueirasii* Sendulsky. —a. Flowering branches. —b. Base of the branch complement. —c. Lower glume. —d. Upper glume. —e. Lemma. —f. Palea. —g. Spikelet. —h. Apical part of the inflorescence. —i. Caryopsis, embryo view. —j. Caryopsis, hilum view. —k. Rhizome. —l. Upper portion of the branch leaf sheath and base of the blade (abaxial surface). —m. Culm leaf. Based on *Filgueiras & Pereira 953* except for k and m, which are based on *Filgueiras & Brochado 2009*.

hairs; hairs 12 mm long; abaxial surface glabrous, densely nerved, dark; adaxial surface somewhat shiny, dark, striate, densely nerved; margins glabrous or finely ciliate; inner ligule thick, finely ciliate; outer ligule a short, inconspicuous rim; blades reflexed, deciduous, narrow, 4–5 cm long, 4 mm wide. Branch complement with 20–50 branches, these 30–45 cm long, 1 mm thick, glabrous, smooth, yellowish, 5–6-noded before the leaves, the nodes with fine, whitish pubescence below. Branch leaves 4–7 per complement: sheaths tight, glabrous, the overlapping margin finely ciliate toward base; oral

setae fine, 5–7 mm long, minutely scabrous, crisped distally; inner ligule solid, finely ciliate, ca. 0.5 mm long; outer ligule a short inconspicuous rim; pseudopetiole flat, grayish yellow, slightly puberulent, 3 mm long; blades 4–9 cm long, 8–12 mm wide, L:W = 5–7.5, lanceolate, light green, finely pilose on abaxial surface, more densely pilose at the base, the hairs whitish; adaxial surface glabrous, 2–3 marginal nerves on one side with rows of fine prickle hairs; margins and the apex finely scabrous. Inflorescence terminal on leafy branches, spikelike, pectinate, secund, 3.5–4.5 cm long, with 16–20 spikelets. Rachis densely pilose. Pedicel pilose, at the base swollen into a lateral, globose, tuberous, naked projection. Spikelets 13.5–14 mm long, 3 mm wide, solitary, 1-flowered, bisexual, attenuate, fusiform. Glumes 2, unequal. Lower glume 1-nerved, carinate, mucronate, finely puberulent, 2 mm long, ca. 1 mm wide at the base. Upper glume 8–10 mm long, 3 mm wide, 7–9-nerved, broadly lanceolate, finely puberulent, the apex scabrous, aristulate, the awn ca. 1 mm long; adaxial surface shiny, dark-spotted. Lemma 8–9 mm long, 6 mm wide, broadly lanceolate, 21–23-nerved, the nerves anastomosing in the upper part; abaxial surface puberulent, apically densely strigose near the margin, the hairs thick, short, dark; adaxial surface dark-spotted. Palea 11 mm long, ca. 5 mm wide, glabrous, 2-keeled, narrowly sulcate abaxially, 12-nerved, the nerves obliquely anastomosing; keels finely ciliate; adaxial surface shiny. Rachilla extension bristle-like, 7 mm long, with a minute rudiment. Lodicules not seen. Ovary elongate, style single, the stigmas 2, plumose, the stamens 3, the anthers 6 mm long, dark. Caryopsis 7.5 mm long, ca. 3 mm wide, ellipsoid, rostrate, grayish brown, finely striate, the embryo and the hilum scarcely manifest externally.

*Phenology*. According to Filgueiras (1988 and pers. comm.) two populations of *Merostachys filgueirasii* bloomed and died gregariously in 1980–1982, at the Reserva Ecológica do IBGE (Brazilian Institute of Geography and Statistics), and no regrowth was observed. A few months later, hundreds of seedlings could be seen in the area; these were collected by Filgueiras (*Filgueiras 1021*, IBGE). This collection contains seedlings in different stages of growth. The smallest specimen is 10 cm long, with 5 leaves and the caryopsis still attached. The seedlings of *M. filgueirasii* grew fast and occupied the bare ground left by the parent clump very quickly. By 1992, the two populations had completely re-established themselves at approximately the same site as the previous ones. No previous flowering is recorded.

*Distribution*. Brazil. Distrito Federal: grounds of the Reserva Ecológica do IBGE, gallery forest in *cerrado* vegetation, 850–1340 m, and grounds of Catetinho. However, the population of the type specimen at Catetinho was completely wiped out because the site was cleared for tourist interests.

The swollen lateral projections at the base of the pedicels are very peculiar; these are also found in *M. pluriflora* Munro ex Camus and in *M. skvortzovii* (described later in this paper). In the former they are rather prominent, whereas in the latter they are small and are located on the inner side of the pedicel.

This species was cited by Tarciso S. Filgueiras (1988) as *Merostachys multiramea* and is named for him, a friend and colleague, for his contributions to the knowledge of the Brazilian grasses.

*Paratypes*. BRAZIL. **Distrito Federal:** Reserva Ecólogica do IBGE, 15°57′S, 47°52′W, próximo a cerca W da Recor, 26 Sep. 1980 (fl), *Heringer et al. 5812* (IBGE, K, US), 18 Jan. 1982 (fl), *Filgueiras 955* (IBGE), 8 Jun. 1982 (seedlings), *Filgueiras 1021* (IBGE); Reserva Ecológica do IBGE, mata do ribeirão Taquara, 20 Nov. 1990 (st), *Filgueiras & Brochado 2009* (IBGE, SP).

**Merostachys glauca** McClure & L. B. Smith. TYPE: Brazil. Estado de Santa Catarina: Palhoça, Pilões, mata, 200 m, 24 feb. 1956 (st), *Reitz & Klein 2737* (holotype, US). Figure 4.

Habit unknown. According to McClure & L. B. Smith (1967) only fragments of the midculm are known. Internodes ca. 30 cm long, 1.2–2.5 diam., glabrous and smooth, greenish yellow, whitish glaucous upward, the thinner internodes greenish, smooth, somewhat shiny, finely mottled with very small, dark green rounded spots. Culm walls 1–3 mm thick. Nodes salient, with retrorse white hairs below; supranodal ridge tubiform. Culm leaves deciduous: sheaths oblong, 29 cm long, 11 cm wide, striate, rather rough, with a trace of wax and a few scattered white hairs, the blades not seen. Branch complement with 30–60 branches, these 1–2-noded before the leaves, glabrous. Branch leaves 5–7 per complement: sheaths tight, striate; inner ligule dark, 0.5 mm long, ciliate at the margin; outer ligule a salient rim; pseudopetiole 3–4 mm long, dark, glabrous; oral setae 5 mm long, deciduous; blades narrowly linear-lanceolate, attenuate at the apex, 5–13 cm long, 6–12(–17) mm wide, L:W = 8.3–10.8; adaxial surface glabrous, with 1–2 marginal nerves on one side with rows of fine, sharp, sparse prickle hairs; abaxial surface glabrous except for densely pubescent area at the base beside the mid-

Figure 4. *Merostachys glauca* McClure & L. B. Smith. —a. Flowering branch complement. —b. Part of the inflorescence. —c. Spikelet, showing lower glume and lemma. —d. Spikelet, showing upper glume and lemma. —e. Lower glume. —f. Upper glume. —g. Rachilla segment. —h. Lemma, adaxial surface. —i. Lemma, abaxial surface. —j. Palea with rachilla and rudiment. —k. Upper part of the branch leaf sheath and base of the blade (abaxial surface). Based on *Klein & Sousa Sob. 10480.*

nerve; margins sparsely scabrous. The epidermis of the sheath and the blade presents extremely small, rounded, flat papillae and some small scattered, pointed or unpointed prickle hairs. Inflorescences terminal on leafy branches, spikelike, pectinate, secund, 1.5–3 cm long, with 8–10 spikelets. Rachis and pedicels pilose. Spikelets 1-flowered, solitary, fusiform, 10 mm long, 2.5 mm wide. Glumes 2, unequal. Lower glume 2.5 mm long, 1 mm wide, 1-nerved, finely puberulent, ciliate at the upper margin. Upper glume lanceolate, apiculate, finely puberulent, 6.5–7 mm long, 3 mm wide, 10-nerved,

some nerves anastomosing; adaxial surface shiny, brownish, with a few dark spots; margins ciliate. Lemma broadly lanceolate, 7.5–8 mm long, 4 mm wide, 9-nerved, adaxial surface shiny; abaxial surface densely pilose, the hairs ca. 0.5 mm long, silver-grayish. Palea 8 mm long, ca. 2 mm wide (folded), finely puberulent, 8-nerved, 2-keeled, broadly sulcate abaxially, 8-nerved, the keels ciliate, the sulcus puberulent; adaxial surface shiny, light brown, inconspicuously anastomosing. Rachilla extension about half the length of the palea, finely ciliate. Caryopsis not seen.

*Phenology*. According to Smith et al. (1981) flowering collections are known from 1971–1973.

*Distribution*. Brazil, State of Santa Catarina.

*Merostachys glauca* was originally described from vegetative material only (McClure & L. B. Smith, 1967). Later, the same species, but in flowering stage, was described again (Smith et al., 1981), although without a Latin diagnosis for the floral part. *Merostachys glauca* is distinguished by an unusually densely hirsute lemma and by the long, narrow branched leaf blades. The smooth internodes, mottled with dark green rounded spots, the glaucous-whitish touch upward, the dark-spotted adaxial surface of the branch leaf sheath, and the size of the 1-flowered spikelet suggest that this species resembles *M. caucaiana*.

*Additional specimens examined.* BRAZIL. **Santa Catarina:** Paulo Lopes, Bom Retiro, mata, 400 m, 13 Dec. 1972 (fl), *Klein & Sousa Sob. 10480* (NY); Joinville, Estrada Dona Francisca, mata, 15 Jan. 1974 (st), *Klein & Klein 10996* (NY).

**Merostachys kleinii** Sendulsky, sp. nov. TYPE: Brazil. Santa Catarina: Papanduva, E.R.F., 1 km ao sul da entrada para Papanduva, 800 m, 16 Jan. 1974 (fr), *Klein & Klein 11008* (holotype, RB; isotype, US). Figure 5.

Habitus ignotus. Fragmenta culmorum internodiorum 2–3.5 cm diametro, fistulosa, scabra, maculis et striis atro-viridibus. Nodi pilis densis appressis, retrorsis, albis ad basin. Folia culmorum ignota. Rami in complemento 50–120. Foliorum ramorum laminae 3–9 cm longae, 7–15 mm latae, lanceolatae. Inflorescentia spiciformis, secunda, 3–6 cm longa. Spiculae 2-flosculata, usque 16 mm longa, congestae, dense aggregatae, 2-seriatae; gluma inferior 4 mm longa; gluma superior 12–14 mm longa, 15-nervia, apiculata; flosculi bisexuales, late fusiformes, 10–12 mm longi; lemma 10 mm longum, 16–17-nervium; palea fusiformis, 11–12 mm longa, 12–14-nervia, late sulcata. Rachillae projectura plana, ca. 1 mm lata; projectura flosculi superioris setiformis, rudimento ornata. Caryopsis late ovoidea, 6–7 mm longa, atro-lutea aut brunnea.

Habit unknown. Fragments of the culm internodes 2–3.5 cm diam., fistulose, scabrous, gray-greenish, with dark green spots and stripes. Culm walls of the middle internodes 2–3.5 mm diam. Nodes salient, prenodal zone with dense, appressed, retrorse, whitish silky hairs below. Culm leaves not seen. Branch complement dense, with 50–120 branches, these 15–40 cm long, 1–1.5 mm thick, glabrous, smooth, grayish green, 2–3-noded before the leaves, nodes dark. Branch leaves 4–5 per complement: sheaths tight, glabrous, the margins glabrous; oral setae fine, finely scabrous, deciduous; inner ligule short, dark, finely ciliate; outer ligule a salient rim; pseudopetiole dark, 2.5 mm long, 1 mm wide; blades 3–9 cm long, 7–15 mm wide, L:W = 4.2–6, lanceolate, apically attenuate, adaxially somewhat rough, 2–3 marginal nerves on one side with rows of fine prickle hairs, abaxially glabrous except for the densely pubescent base, the hairs long, villous, whitish, beside the midnerve. Inflorescences terminal on leafy branches, spikelike, secund, congested, 3–6 cm long, 2 cm wide, with 28–32 densely agglomerated spikelets in double rows. Rachis pilose. Pedicels short, pilose. Spikelet always 2-flowered, 16 mm long, florets bisexual, broadly fusiform, 10–12 mm long, 4 mm wide (with mature fruit), glabrous. Glumes 2, very unequal. Lower glume ca. 4 mm long, 1.5 mm wide, 1-nerved, puberulent, ciliate at the margins. Upper glume 12–14 mm long, 5 mm wide, broadly lanceolate, apiculate, finely puberulent, 15-nerved, some nerves anastomosing; adaxial surface shiny, brownish, densely dark-spotted. Lemma 10 mm long, 6 mm wide, broadly lanceolate, puberulent, 16–17-nerved, some nerves anastomosing; adaxial surface shiny, brownish, densely dark-spotted. Palea fusiform, 11–12 mm long, ca. 6 mm wide, glabrous, 12–14-nerved, broadly sulcate abaxially, the keels ciliate, some nerves anastomosing; adaxial surface shiny, golden. Rachilla extension between the florets flat, ca. 1 mm wide, finely puberulent, hairs whitish, bearing a fertile upper floret identical to the lower one. Rachilla extension of the upper floret bristle-like, with a small rudiment at the tip. Caryopsis broadly ovoid, basally and apically rounded, rostrate, dark yellow, 6–7 mm long, 4–4.5 mm wide, the embryo and the hilum scarcely manifest externally.

*Phenology*. Flowering collections are known only from 1974.

*Distribution*. Southern Brazil.

*Merostachys kleinii* seems to be a robust plant, with thick culms. This species can be found in several herbaria, but complete vegetative collections are still

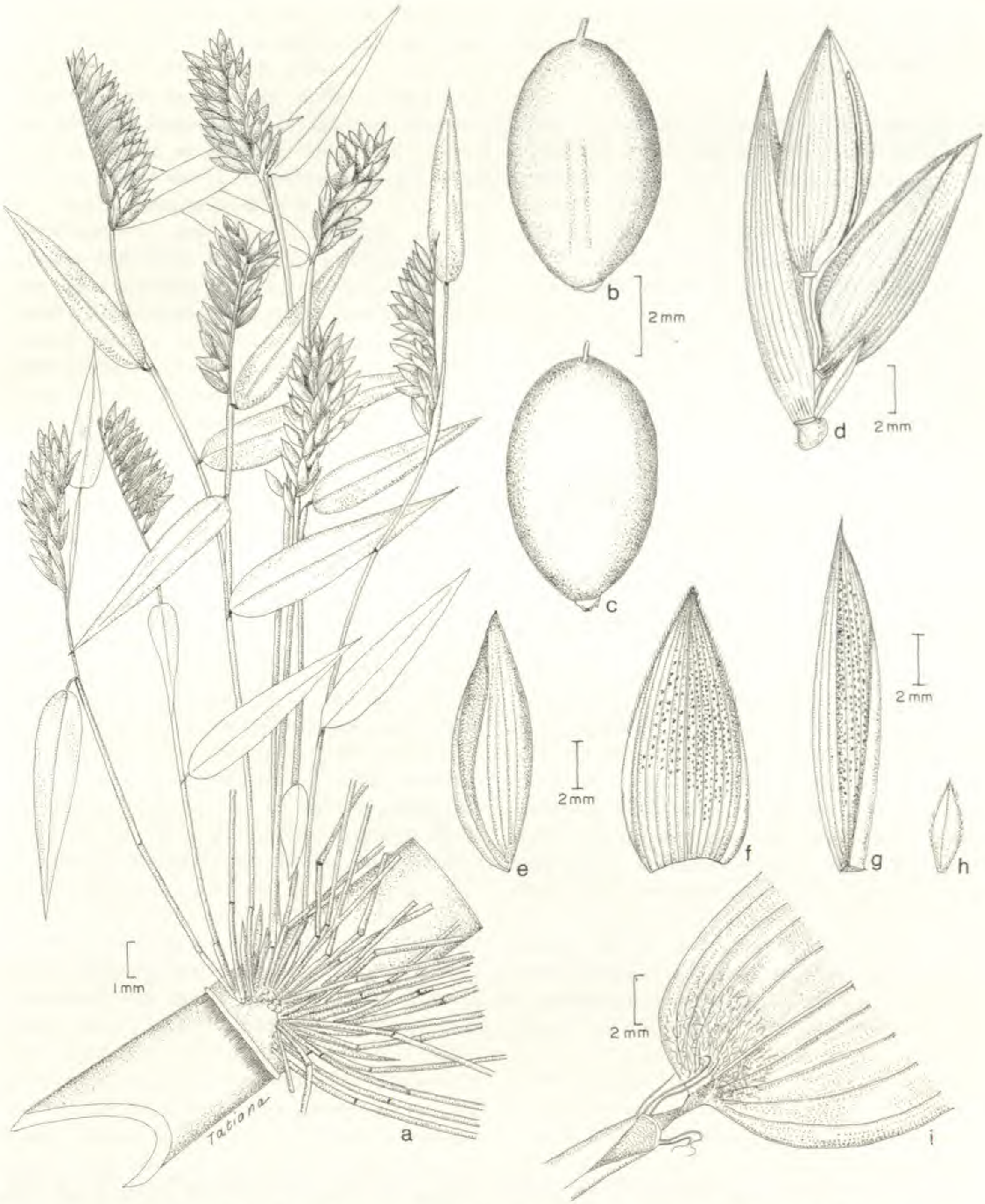


Figure 5. *Merostachys kleinii* Sendulsky. —a. Flowering branch complement. —b. Caryopsis, hilum view. —c. Caryopsis, embryo view. —d. Spikelet with two fertile florets and a rudiment. —e. Palea. —f. Lemma. —g. Upper glume. —h. Lower glume. —i. Upper portion of the branch leaf sheath and base of the blade (abaxial surface). Based on *Klein & Klein 11008*.

not available. The species is distinct in its 2-flowered spikelet, the stout appearance of its branch complements, inflorescences and spikelets, and in having the largest caryopsis in the *multiramea* group. For many years this species was conceived as being a 2-flowered form of "*multiramea*." The true *M. multiramea* Hackel already is a 2-flowered species. *Merostachys kleinii* is named in honor of the late Roberto M. Klein, a distinguished botanist from Itajaí, Santa Catarina, Brazil.

*Paratype.* BRAZIL. **Santa Catarina:** 2 km a leste de Bocaina do Sul, 900 m, 22 Jan. 1974 (fr), *Klein & Klein 11062* (SP).

**Merostachys magellanica** Sendulsky, sp. nov. TYPE: Brazil. State of São Paulo: Município Anhembi, Fazenda Barreiro Rico, 22°40′S, 48°09′W, 510 m, 11 Jan. 1988 (fr), *Reis de Magalhães s.n.* (holotype, SP 248339; isotypes, BLA, BR, IBGE, ICN, K, MO, NY, P, R, RB, UB, UEC, US, W, WIS). Figure 6.

Culmi ca. 6–8 m alti, 12–14 mm diametro, fistulosi; internodia 60–80 cm longa; infera laevia, luteo-cinerea, striis maculisque viridi-fuscis minutis picta; supra cinereo-viridia, aculeis retrorsis munita; nodi prominentes, supra subterque nodum pilis lanatis densis brevibus vestita. Folia culmorum laminae reflexae, ca. 5–12 cm longae, 12–15 mm latae. Rami verticillati, in complemento 12–130. Folia ramorum laminae 8–17 cm longae, 1.5–2 cm latae, lanceolatae. Inflorescentia spiciformis, pectinata, imbricata, 6–8 cm longa, ramum foliorum terminans. Spiculae 11–14 mm longae, fusiformes ubi juvenes, ad maturitatem ovoidae, apicibus attenuatis, duabus lineis albis parallelis, longitudinalibus, carenis palearum formatis. Caryopsis oblonga, ovoidea, asymmetrica, lageniformis, rostrata, 6–7 mm longa, castanea.

Rhizomes sympodial, pachymorph. Culms woody, ca. 6–8 m tall, 12–14 mm diam., fistulose, erect; internodes 60–80 cm long; lower internodes grayish yellow, with minute dark green stripes and spots, smooth and shiny above the nodes; upper internodes greenish gray, with small, retrorse prickle hairs; culm walls 2 mm thick; nodes salient, with a band of short, dense, woolly hairs above and below. Culm leaves deciduous: sheath 25–30 cm long, 5–7 cm wide, rounded and asymmetrical at the summit, fringed with fine, wavy hairs, these reddish brown, but white at the base, 5–6 mm long, diminishing in size downward along the margins of the sheath; abaxially olive-green, many-nerved, the nerves fine, light-colored, smooth, shiny; blade reflexed, 5–12 cm long, 12–15 mm wide, attenuating gradually to a fine point. Branch complement with 12–130 subequal branches, these 15–65 cm long, 1–2 mm thick, 2–3-noded before the leaves, yellowish, nearly glabrous and shiny, with green stripes, sometimes with minute retrorse prickle hairs, the base with a few densely strigose, deciduous scales, these 3–20 mm long; first internode above the scales densely and retrorsely strigose. Foliage leaves 4–7 per complement. Sheath tight, glabrous, striate, the lower sheath aphyllous or with a rudimentary leaf and a few oral setae, the uppermost a little loose at the summit. Oral setae erect or crisped distally, 3–10 mm long, dark yellow or red-brown, slightly diminishing in size downward along the upper margin of the sheath, then giving way to a fine row of short, silver cilia. Inner ligule a thick, dark yellow structure, ca. 0.5 mm long, finely ciliate on the margin; outer ligule a salient, light-colored rim. Pseudopetiole dark, dorsiventrally compressed, adaxially scaberulous and waxy, glabrous on abaxial surface. Blades linear-lanceolate, 8–17 cm long, 1.5–2 cm wide, L:W = 5.3–8.5 (the lowermost and the uppermost smaller, 2.5–6 cm long, 3–4 mm wide), the base slightly asymmetrical, rounded to cuneate, gradually attenuate toward a scabrous apex, subglabrous on both surfaces, the adaxial surface sometimes finely hirsute near the base and also bearing 2–8 rows of hyaline, antrorse-strigose prickle hairs along the nerves near one margin; the nerves inconspicuous on the adaxial surface, weakly salient on the abaxial surface. Inflorescences terminal on leafy branches, spikelike, falcate, congested, secund, 6–8 cm long, with distinctive row of upper glumes when young or in early flowering stage, when mature and fruiting, 12–18 cm long, with loose, open, broadly spreading spikelets; rachis finely strigose, hairs white, sometimes with a rudimentary leaf emerging at the top of the oblique scar at the base of the inflorescence and subtending the lowermost spikelet. Spikelets 11–14 mm long, 1.8–2(–4) mm wide, 1-flowered, slightly curved, attenuate, narrowly fusiform when immature, ovoid when mature, swollen at the base, attenuate at the apex, grayish olive-green, except for two parallel, longitudinal, white, evident lines formed by the keels of the palea. Pedicels short, densely hispid. Glumes 2, unequal. Lower glume 3–3.5 mm long, 1 mm wide, triangular, 1-nerved, slightly curved, shortly strigose at the apex, ca. ¼ the spikelet length, the mid-nerve spotted adaxially, the spots dark, purplish. Upper glume 5.5–7.5 mm long, 3 mm wide, lanceolate, apiculate, 9-nerved, shortly strigose, ½ the spikelet length, the adaxial surface shiny, with large, dark spots; when young, glumes forming a clear line along the row of densely imbricated spikelets. Rachilla segment between the upper glume and the lemma 2.5 mm long, cup-shaped, 1.2 mm diam., finely strigose, the hairs white. Lemma 10–11.5 mm long, 5–5.5 mm wide, oblong, lanceolate, 14–15-nerved, finely strigose abaxially, shiny, dark-spotted adaxially, ciliate at the margins, embracing the palea (at maturity only at the base). Palea a little longer than the lemma, 10.5–12.5 mm long, 4 mm wide, curved, 8–12-nerved, with oblique transverse veinlets, the dorsal keels white, minutely ciliate, the adaxial surface shiny, dark-spotted. Prolongation of the rachilla bristle-like, nearly as long as the palea, pubescent near the minute rudiment. Lodicules 3, 3.3 mm long, finely ciliate at the apex, faintly 2–3-nerved.

Figure 6. *Merostachys magellanica* Sendulsky. —a. Lodicules. —b. Lower glume. —c. Upper glume. —d. Detail of the abaxial surface of the upper glume. —e. Lemma. —f. Palea. —g. Spikelet, lemma side view. —h. Spikelet, palea side view. —i. Spikelet, lateral view. —j. Bisexual flower. —k. Palea. —l. Mature inflorescence, fruiting stage. —m. Base of the spikelet. —n. Oral setae. —o. Caryopsis hilum view. —p. Caryopsis, embryo view. —q. Caryopsis, lateral view. —r. Apex of a blade. —s. Base of a blade, adaxial surface. —t. Branch complement of the upper and slender part of a culm, with young inflorescences. —u. Mature spikelet, with parallel, white keels on the palea. All illustrations based on *J. G. Kuhlmann s.n.* (US 1255439) except l, o, p, q, and u, which are based on *Reis de Magalhães s.n.* (SP 248339).

Stamens 3, the anthers 9 mm long. Ovary oblong, subcylindrical; style single; stigmas 2, long-fringed when mature. Caryopsis oblong, 6–7 mm long, (lagenoid) curved or asymmetrical in the dorsiventral plane, sulcate, apically long rostrate; pericarp glabrous, of uniform thickness, light brown; embryo small, basal; hilum linear, but the embryotegium weakly manifested externally.

*Phenology.* *Merostachys magellanica* has been collected in its fertile state in 1891, 1921–1922, 1956, and 1988–1990. These collections suggest a flowering cycle of 30–34 years.

*Distribution.* Brazil, in the States of Rio de Janeiro and São Paulo, from sea level to ca. 700 m.

The first known collection of *Merostachys magellanica* was made in Peruíbe, São Paulo, in 1891, followed by the collections in 1921 and 1922 in Rio de Janeiro. Mature caryopses were collected in 1956 by José Carlos Reis de Magalhães on his ranch, "Barreiro Rico," in the State of São Paulo (this is, in fact, a well-kept private forest reserve). Werner Bockermann, a zoologist at the São Paulo Zoological Garden, has studied these caryopses as a food supply for birds in the reserve.

When *Merostachys magellanica* flowered again in 1988 and set seed in quantity, a large collection was made by Reis de Magalhães and sent to the Institute of Botany in São Paulo, together with accurate data and observations concerning the habitat: soil analysis, rainfall, climate, behavior of the bamboos, etc. According to Reis de Magalhães, the poorest soil was exactly in the area where the species was collected. The adjacent forest area, 500 m away, with much better soil, has few or no bamboos. Thus, this new species shows a distinct preference for poor soil.

*Merostachys magellanica* is characterized by the spikelets, which have two white, longitudinal lines formed by the keels of the palea, and by the general aspect of the congested inflorescences when young, which present upper glumes in a distinctive row. When mature, the inflorescences are twice as long as wide, with loose, open, broadly spreading spikelets and have light brown, dorsiventrally asymmetrical caryopses.

*Merostachys magellanica* is named for José Carlos Reis de Magalhães, collector of the type collection, who in his respect for and love of nature knows few equals.

*Paratypes.* BRAZIL. **Rio de Janeiro:** Botafogo, Mundo Novo, 11 Nov. 1921 (early fl), *J. G. Kuhlmann s.n.* (RB 79198, US 1447816); Corcovado, Morro do Mundo Novo, Oct. 1922 (fl), *J. G. Kuhlmann s.n.* (US 1255439); Reserva Florestal da Fabrica Aliança, Sep. 1922 (fl-abnormal), *J. G. Kuhlmann s.n.* (RB 3852, US 1447817). **São Paulo:** Peruíbe, 1891 (fl), *Loefgren & Edwall s.n.* (US 1021511); Município Itatins, Iguape, Estação Ecológica Juréia, 19 Nov. 1987 (fl), *Catharino 1334* (SP); Município Anhembi, Fazenda Barreiro Rico, 21 fev. 1956 (fr), *Reis de Magalhães s.n.* (SP 248383); Cananéia, Out. 1956 (fr), *Pereira s.n.* (SP 169270); Parque Estadual da Ilha do Cardoso, 8 Dec. 1987 (fl), *Kirizawa 1984* (SP); Ilha do Cardoso, estrada para turbina, 3 Dec. 1990 (fl), *Barros 2024* (SP); Ilha do Cardoso, Cambriú, 23 Aug. 1988 (late fr), *Rossi et al. 486* (SP).

**Merostachys multiramea** Hackel. *In* Feddes Repert. Nov. Spec. Regni Veg. 7: 326. 1909. TYPE: Brazil. Rio Grande do Sul: Município Rio Pardo, Fazenda Itacolomi, elev. 70 m, Apr. 1906 (fl), *Jürgens s.n.* (label G-308) (holotype, W). Figure 7.

*Merostachys anomala* Dutra, Revista Sudamer. Bot. 5: 151. 1938. Fig. 2, p. 149, under *M. burchellii* Munro *emend.* Dutra (figures misplaced). Syn. nov. TYPE: Brazil. Rio Grande do Sul: São Leopoldo, Fazenda da Pedreira, 6 Oct. 1906 (fl), *Dutra 518* (holotype, BLA; isotype, US).

Culms woody, fistulose, terete, yellowish gray, glabrous, smooth, but densely pilose near the nodes, 12 m long, according to *C. Jürgens s.n.* (label G-308); pendulous above, 6–9 m high, 3–4 cm diam. below, according to Dutra (1938); nodes prominent, glabrous, densely pilose above, pilose and also with a row of white, dense, brushlike, retrorse hairs below. Culm leaves of an incompletely developed shoot (see discussion): sheaths 20–25 cm long, 5–6 cm wide, symmetrical, papery, opaque, rugose adaxially, fringed with dense, wavy, reddish hairs at the summit, diminishing in size downward along the upper margin; inner ligule a thick membrane, 1–2 mm long, opaque; outer ligule a salient rim; blades lanceolate, asymmetrical, ca. 7 cm long, 1 cm wide, gradually attenuate to a very fine point. Branch complement with 30–70 unequal leafy branches, these 5–50 cm long, 1–1.2 mm thick, glabrous, smooth, grayish green, 2–3-noded before the leaves; nodes prominent, dark, the base densely covered with small, deciduous, apiculate, glabrous scales. Foliage leaves 3–8 per complement, the leaves of the flowering branches smaller than those of the sterile ones. Sheaths tight, glabrous, striate, the margins finely ciliate or glabrous. Oral setae 3–4 mm long, straight, white, extremely deciduous. Inner ligule papery, finely ciliate on the margin, 0.5 mm long. Outer ligule a salient rim. Pseudopetiole glabrous, dark, flat, 2.5–4 mm long. Blades 3–20 cm long, 5–20 mm wide, lanceolate or narrowly lanceolate, attenuate to a very narrow, filiform point, the base rounded to cuneate, slightly asymmetrical, subglabrous on both surfaces except for a small area on the abaxial surface near the base, bearing short, white, dense hairs mixed with wax and for 2–3 lateral nerves on the adaxial surface near one margin, bearing parallel rows of antrorse, strigose, hyaline prickle hairs. Inflorescence 5–7(–9) cm long, straight or subfalcate, secund, terminal on a leafy branch, usually fully exserted from the uppermost sheath when mature. Peduncle of the inflorescence and the rachis densely strigose, the hairs white.

Figure 7. *Merostachys multiramea* Hackel. —a. Part of a branch complement with some young inflorescences. —$a_1$. Mature inflorescence. —b. Part of the spike. —c. Lower glume. —d. Upper glume. —e. Lemma. —f. Palea, abaxial surface. —g. Palea, adaxial surface. —h. Spikelet, glumes removed. —i. Bisexual flower. —j. Lodicules. —k. Base of a leaf, adaxial surface. —l. Caryopsis, hilum view. —m. Caryopsis, lateral view. —n. Caryopsis, embryo view. —o. Base of a leaf, adaxial surface, showing ligule and a few oral setae. —p. Culm leaf. All illustrations based on *Dutra 518*, except $a_1$, which is based on *Dutra 517*.

Spikelets 2-flowered, 11–12 mm long, grayish green, with wrinkled surface, both florets bisexual, 7–9 mm long, 3 mm wide, laterally strongly compressed when immature, prominently keeled, imbricate at an angle of 45°. Pedicel ca. 1 mm long, densely hispid. Glumes 2, unequal. Lower glume 2.5–3 mm long, 1 mm wide, lanceolate, 1-nerved, the abaxial surface puberulent, the margins densely ciliate. Upper glume

7–9 mm long, ca. 5 mm wide, half as long as upper floret, carinate, apiculate, asymmetrical, 9-nerved, the nerves anastomosing; abaxial surface finely hirsute-appressed, the margins finely ciliate. Rachilla segment between the lower and the upper florets 2–3.5 mm long, flattened, narrow below, dilated at the apex, finely appressed-pubescent. Lemma 8 mm long, 5 mm wide, carinate, adaxially slightly dark-spotted, 9–11-nerved. Palea 8 mm long, curved, bicarinate, broadly canaliculate between the finely ciliate keels, 8-nerved, the veinlets anastomosing in the upper part. Prolongation of the rachilla (on the upper floret only) bristle-like, flattened, half as long as the palea or a little over, bearing a minute rudiment. Lodicules 3, membranous, ca. 0.7 mm long, ciliate at the apex. Stamens 3, the anthers 4–5.5 mm long. Ovary oblong, subcylindrical; style single; stigmas 2, plumose. Caryopsis 6–7 mm long, 3 mm wide, conical, attenuate at the apex, rostrate, dark brown, nearly black, shiny; embryo small, basal; hilum linear, but the sulcus and the embryo weakly manifested externally.

*Phenology*. Flowering collections are known from 1876 (Dutra, 1938), 1906–1907, 1914–1915, 1937–1939, and 1974–1978.

*Distribution*. Southern Brazil.

The description of the culm leaves of *Merostachys multiramea* is based on *Prance et al. 6887*, the only collection in which these leaves are present. This material is not very typical of the species; together with *Gibbs et al. 6672* and *Ihering s.n.* (NY, SP 10315) it makes up a group of three similar specimens, all collected in the State of São Paulo. If these specimens can be admitted as good *M. multiramea*, the description of the culm leaves is valid. The only difference between these collections and the others is that the spikelets are not wrinkled and the short hairs that cover the spikelets are black and not so worn out and colorless as on the spikelets of the specimens from the State of Rio Grande do Sul.

*Additional specimens examined*. BRAZIL. **Paraná:** Ipiranga, *Dusen 14367*, 5 Jan. 1914 (fl) in US sheet, and 15 Jan. 1915 (fl) in WIS sheet. **Rio Grande do Sul:** Valle do Rio Taquari, São Leopoldo, 1907 (fr), *Dutra s.n.* (NY, SP 10313, US 1503502); Suburbios, Oct. 1906 (fl), *Dutra 151* (RB); Bom Jesus, Fazenda Carauna, 1907 (fl and fr), *Dutra 517* (BLA); São Leopoldo, Quilombo, Nov. 1937 (fl), *Dutra 1634*, (ICN); Panambí, 4 Oct. 1970 (fl), *Pott s.n.* (BLA 8363). **São Paulo:** Reserva Carlos Botelho, entre S. Miguel Arcanjo e Sete Barras, elev. ca. 800 m, 31 Jan. 1978 (fl), *Prance et al. 6887* (RB, US); Rodovia Jaquiá a Piedade, 29 Oct. 1977 (fl), *Gibbs et al. 6672* (SP); São Bernardo, Oct. 1914 (fl), *Ihering s.n.* (NY, SP 10315).

**Merostachys pilifera** Sendulsky, sp. nov. TYPE: Brazil. Rio Grande do Sul: Mun. São Francisco de Paula, Primeiro Distrito, São Francisco de Paula, Morro da Pera (uppermost part of Serra Geral), 29°27′S 50°35′W, alt. 970 m, 11 May 1972 (fl), *Soderstrom & Sucre 1987* (holotype, RB). Figure 8.

Culmi usque 20 m longi, fistulosi ad extremitates solidi. Culmi internodia dense pilosa supra et infra nodos, pilis translucidis, appressis, ca. 1 mm longis. Folia culmorum ignotae. Crista supranodalis tubiformis. Rami in complemento 50 ad extremitates culmorum. Foliorum ramorum laminae lanceolatae, 2–8 cm longae, 4–12 mm latae. Inflorescentia spiciformis, pectinata. Spiculae 1-flosculata, bisexualis, late elliptica, 13–14 mm longa; gluma infera 2.5 mm longa; gluma supera 9 mm longa; 11-nervia; lemma 10 mm longum, 15-nervium; palea fusiformis, 11 mm longa, 10–12-nervia, anguste sulcata. Caryopsis non visa.

Woody, according to the collectors' note, culms erect, up to 20 m tall, 5 cm diam., closely clumped and forming a thicket; internodes fistulose, 60–65 cm long at base, with thin walls, becoming shorter, successively thinner and solid above; the tips whip-like, arching. New culm internodes densely pilose above and below the nodes, the hairs sericeous, translucent, appressed, thick, ca. 1 mm long, these substituted in some occasionally hairless parts of the internode areas by dense, sharp, retrorse prickle hairs with globose, yellowish bases, together with some scattered sericeous hairs. The old thick culms still display prickles and areas with worn and damaged hairs. Nodes salient, supranodal ridge tubiform, especially evident in new culms, prenodal zone with dense, appressed, retrorse hyaline hairs. Culm leaves not seen. Branch complement from tip of the culm (internode 5 mm diam.) with 50 branches, these 15–20 cm long, ca. 0.5 mm thick, glabrous, smooth, 1–2-noded before the leaves. Branch leaves 2–3 per complement: sheaths tight, finely puberulent; the overlapping margin glabrous; adaxial surface shiny, golden, dark-spotted; oral setae fine, ca. 5–6 mm long, straight; inner ligule short, finely ciliate; outer ligule an inconspicuous rim; pseudopetiole dark, finely puberulent, 2–2.5 mm long; blades lanceolate, 2–8 cm long, 4–12 mm wide, L:W = 6.2–6.6, glabrous, the abaxial surface with a very few fine hairs. Inflorescences terminal on leafy branches, 2–3.5 cm long, spikelike, pectinate. Rachis and pedicels pubescent. Spikelets solitary, 1-flowered, bisexual, broadly ellipsoid, somewhat inflated, 13–14 mm long, 4 mm wide. Glumes 2, unequal. Lower glume 2.5 mm long, ca. 1 mm wide, shortly awned, 1-nerved. Upper glume broadly lanceolate, 9 mm long, 4 mm wide, shortly awned, 11-nerved, some nerves anastomosing, the adaxial surface dark-spot-

Figure 8. *Merostachys pilifera* Sendulsky. —a. Flowering branch complement. —b. Lodicules. —c. Hermaphroditic flower. —d. Spikelet. —e. Apical portion of the inflorescence. —f. Culm hairs. —h. Lower glume. —i. Upper glume. —j. Lemma. —k. Palea. —l. Upper portion of the branch leaf sheath and base of the blade (abaxial surface). Based on *Soderstrom & Sucre 1987*.

ted. Lemma very broadly lanceolate, deeply concave, enclosing a palea, 10 mm long, 7 mm wide, 15-nerved, finely puberulent abaxially, the adaxial surface dark-spotted, the margins densely ciliate upward. Palea fusiform, 11 mm long, 2.5 mm wide (folded), 10–12-nerved, 2-keeled, narrowly sulcate, the keels finely ciliate, abaxially puberulent at the apex and along the sulcus; some nerves anastomosing; adaxial surface shiny. Lodicules 3, subequal, ca. 2.5 mm long, finely ciliate. Stamens 3, the

anthers dark, ca. 10 mm long. Ovary elongate, style single, stigmas 2. Caryopsis not seen.

*Phenology*. The only known specimen of this species is the holotype, collected in 1972.

*Distribution*. Known only from the type locality.

*Merostachys pilifera* is known only from the type locality in the State of Rio Grande do Sul. The description presented above was based solely on *Soderstrom & Sucre 1897*, 1972. The label states that the entire colony of this bamboo flowered after this date and is represented by *Soderstrom 2040*, 2 Feb. 1973 (US). *Merostachys pilifera* is distinguished by its pilose culm internodes, the character from which the name is derived. It is somewhat similar to *M. abadiana* in the details of the spikelet structure.

**Merostachys scandens** Sendulsky, sp. nov. TYPE: Brazil. State of São Paulo: Município de São Paulo, 10 km S of center of city of São Paulo, in grounds of the Instituto de Botânica, Parque do Estado, 6 Dec. 1973 (fl), *Sendulsky 1319* (holotype, SP; isotypes, BLA, BR, IBGE, ICN, K, MO, NY, P, R, RB, UB, UEC, US, W, WIS). Figure 9.

Culmi ca. 6 m longi, 1–3 cm diametro; internodia fistulosa, subtiliter rugulosa; nodi pilis densis, appressis, retrorsis. Foliorum culmorum laminae angustae, 8–12 cm longae, 4–5 mm latae. Rami in complemento 40–60(–100). Foliorum ramorum laminae lanceolatae, glaucovirides, 3.5–10 cm longae, 8–14 mm latae. Inflorescentiae spiciformes, 5–6 cm longae, ramorum foliorum terminantes. Spiculae ellipticae, 1-flosculatae, 13–14 mm longae, distichae, lateraliter dispositae; gluma infera 4.5–5 mm longa; gluma supera 9–10 mm longa, 15-nervia; lemma 11 mm longum, 19–23-nervium, ad marginem superiorem strigosum; palea fusiformis, 11 mm longa, 12-nervia, anguste sulcata. Caryopsis ovoidea ad apicem subtiliter attenuata, 5.5–6.5 mm longa, cinereo-lutea.

Caespitose, woody bamboo. Culms ca. 6 m long, 1–3 cm diam., flexuous, with long, attenuate, threadlike, pendent or clambering tips. Internode fistulose, finely rugose, dark gray, with dull green stripes. Culm walls ca. 2 mm thick. Nodes salient, prenodal zone with dense appressed whitish, retrorse hairs. Culm leaves deciduous: sheaths 15–25 cm long, 4–8 cm wide, narrowing toward the summit, fringed at the apex with 1-cm-long, golden reddish, distally crisped hairs; abaxial surface glabrous, densely nerved; adaxial surface somewhat shiny or dark, apically tessellate; margins glabrous; inner ligule 1 mm long, finely ciliolate; outer ligule a salient rim; blades reflexed, deciduous, narrow, 8–12 cm long, 4–5 mm wide, attenuate, forming a fine point. Branch complement with 40–60(–100) branches, these 30–60 cm long, 1–1.5 mm thick, grayish, glabrous or puberulent, 2–3-noded before the leaves, nodes glabrous. Branch leaves 5–6 per complement: sheaths tight, glabrous, the intercostal zone finely transversely rugose, the overlapping margin glabrous; oral setae fine, deciduous, ca. 3 mm long; inner ligule ca. 0.8 mm long, finely ciliolate; outer ligule a salient rim; pseudopetiole flat, slightly puberulent, 2.5 mm long; blades 3.5–10 cm long, 8–14 mm wide, L : W = 4.4–7.1, lanceolate, glaucous-green, adaxially glabrous, 2–3 marginal nerves on one side with rows of very fine prickle hairs; abaxial surface glabrous except for finely strigose base, the margins and the apex very finely scabrous. Inflorescences terminal on leafy branches, spikelike, 5–6 cm long, with 17–18 spikelets, these distichously arranged, distinctly separate and laterally outspread along the narrow, obscurely triquetrous, slightly sinuous, densely pilose rachis or rarely pectinate. Spikelets solitary, 1-flowered, bisexual, ellipsoid, 13–14 mm long, 3 mm wide. Glumes 2, unequal. Lower glume 1-nerved, carinate, attenuate toward the apex, finely puberulent, 4.5–5 mm long, ca. 1 mm wide at the base. Upper glume 9–10 mm long, 4 mm wide, broadly lanceolate, carinate, finely puberulent, 15-nerved, some nerves anastomosing, the apex scabrous, aristulate, ca. 1 mm long; adaxial surface shiny, dark-spotted; margins finely ciliate. Lemma 11 mm long, 5–5.5 mm wide, lanceolate, 19–23-nerved, the nerves anastomosing; abaxial surface somewhat strigose, the hairs appressed, longer and denser toward the upper margins, these densely ciliate; adaxial surface shiny, dark-spotted. Palea fusiform (folded), 11 mm long, ca. 4 mm wide, glabrous, opaque, 2-keeled, narrowly sulcate abaxially, 12-nerved, the nerves obliquely anastomosing in the upper part; keels finely ciliate, the hairs dark red; adaxial surface shiny. Rachilla extension bristlelike, 9 mm long, with a minute rudiment. Lodicules 3, subequal, 2.5 mm long, finely ciliate at the apex. Stamens 3, the anthers 12 mm long, dark. Ovary elongate, the style single, the stigmas 2, plumose; stigmatic papillae sharply pointed. Stamens 3, the anthers 12 mm long, dark. Caryopsis 5.5–6.5 mm long, ca. 3 mm wide, ovoid, apically slightly attenuate, rostrate, grayish yellow, smooth, apically slightly attenuate, the embryo and the hilum scarcely manifested externally.

*Phenology*. The flowering collections are known from 1941 and 1972–1974, thus suggesting a flowering cycle of 31–33 years.

*Distribution*. Southern Brazil.

*Merostachys scandens* was in bloom at the same time as *M. skvortzovii* (described later in this paper)

Figure 9. *Merostachys scandens* Sendulsky. —a. Flowering branch complement. —b. Gynoecium with two lodicules. —c. Stigmatic papillae. —d. Spikelet in bloom (flowering cycle 1973). —e. Lodicules. —f. Apical part of the inflorescence. —g. Culm leaf. —h. Caryopsis, hilum view. —i. Caryopsis, embryo view. —j. Lower glume. —k. Upper glume. —l. Lemma. —m. Palea. —n. Upper portion of the branch leaf sheath and base of the blade (abaxial surface). Based on *Sendulsky 1319*.

and in the same forest of the Biological Reserve, on the grounds of the Instituto de Botânica, São Paulo. The plants did not form dense clumps, but were slender and leaning on vegetation. The glaucous-green leaves are distinct from the green leaves of *M. skvortzovii*. Because the plant was deep in the shaded forest, the visiting insects were not observed (see the discussion in *M. skvortzovii*). The habit of the inflorescence, its widely separated distichous spreading spikelets, is of some interest. This orga-

nization of the inflorescence is quite rare in the genus and contradicts the significance of the name *Merostachys*, formed from the Greek *meros*, part (partial or incomplete), and *stachys*, spike, alluding to the secund (one-sided) profile of the inflorescence (McClure, 1973). In *M. scandens* the inflorescence may sometimes also be pectinate, when for some unknown reason the very narrow rachis bends longitudinally over the ventral surface, bringing together its margins and the spikelets of two opposite rows.

*Paratypes.* BRAZIL. **São Paulo:** Município de São Paulo, 10 km S of center of city of São Paulo, in grounds of the Instituto de Botânica, Parque do Estado, 6 Dec. 1973 (fl), *Sendulsky 1317* (SP), 6 Dec. 1973 (fl), *Sendulsky 1320* (SP, US), 17 Dec. 1973 (fl), *Sendulsky 1323* (SP, US); Reserva Biológica, Parque Estadual das Fontes do Ipiranga, 8 Mar. 1974 (fr), *Sendulsky 1365* (SP); São Paulo, nativa no Jardim Botânico, 1 Dec. 1941 (fl), *O. Handro s.n.* (SP sheet 79756).

**Merostachys skvortzovii** Sendulsky, sp. nov. TYPE: Brazil. Estado de São Paulo: São Paulo, Parque do Estado e Jardim Botânico, 20 Oct. 1973, *Skvortzov s.n.* (holotype, SP 120954). Figure 10.

Culmi 4–6 m longi, 2–3 cm diametro; internodia fistulosa, scabra; nodi subpilosi, pilis albis. Foliorum culmorum laminae lanceolatae, 6–10 cm longae, 10 mm latae. Rami in complemento 150–200. Foliorum ramorum laminae lanceolatae, 3–11 cm longae, 6–16 mm latae. Inflorescentia spiciformis, pectinata, 1.5–3 cm longa, ramorum foliorum terminans. Spiculae 10–12 mm longae, fusiformes, 1-flosculatae; gluma infera 1.5 mm longa; gluma supera 8–9 mm longa, 9–11-nervia, aristulata; lemma ca. 9 mm longum, 16–18-nervium, puberulum, ad apicem strigosum; palea ca. 10 mm longa, 13–14-nervia, anguste sulcata. Caryopsis ovoidea, ad apicem globosa, 5 mm longa et ca. 3 mm lata, cinereo-latea.

Caespitose, woody bamboo, forming dense clumps. Culms 4–6 m long, 2–3 cm diam., erect except for the flexuose tips. Internodes fistulose, scabrous, with dark green stripes. Culm walls of the middle internodes 1–1.5 mm thick. Nodes salient with a touch of whitish pubescence above and below, younger nodes with short, tubiform supranodal ridge. Culm leaves deciduous: sheath 15–20 cm long, 5–6 cm wide, auriculate, fringed at the apex with a few hairs, abaxial surface glabrous, densely nerved, dark; adaxial surface opaque, dark, striate, tessellate above; inner ligule 1 mm long, finely ciliate at the margin, the cilia white; outer ligule a short inconspicuous rim; margins glabrous; blades lanceolate, reflexed, deciduous, 6–10 cm long, 10 mm wide. Branch complement with 150–200 slender branches, these 20–50 cm long, 1 mm thick, glabrous or finely puberulent, the internodes ca. 4–6 cm long, 2–3-noded before the leaves. Branch leaves 5–7 per complement: sheaths tight, glabrous, striate; oral setae fine, 5–6 mm long; inner ligule a finely ciliolate membrane, ca. 1 mm long; outer ligule a short rim; pseudopetiole flat, 3 mm long, finely puberulent; blades lanceolate, 3–11 cm long, 6–16 mm wide, L:W = 5–6.9, adaxially glabrous, slightly pilose abaxially, densely pilose at the base; when old, glabrous on both surfaces except at the base abaxially; adaxial surface with 3–4 marginal nerves on one side with rows of fine prickle hairs; margins finely scabrous. Inflorescences terminal on leafy branches, spikelike, pectinate, 1.5–3 cm long, with 16–18 spikelets. Rachis and pedicels pilose, some of the pedicels present at base on inner side small, swollen, whitish, rugose projections. Spikelets 10–12 mm long, 3 mm wide, solitary, 1-flowered, acuminate, fusiform. Glumes 2, unequal. Lower glume 1-nerved, carinate, acuminate, finely puberulent, 1.5 mm long, 0.8 mm wide at the base. Upper glume 8–9 mm long, 3.5 mm wide, broadly lanceolate, finely puberulent, 9–11-nerved, the nerves anastomosing in the upper part, the apex scabrous, aristulate, ca. 1 mm long; adaxial surface shiny, dark-spotted. Upper glume sometimes subtending a rudimentary bud (vestige of a depauperate floret attached to rachilla segment). Lemma ca. 9 mm long, 6 mm wide, broadly lanceolate, 16–18-nerved, the nerves obliquely anastomosing in the upper part; abaxial surface puberulent, somewhat strigose in the upper part; adaxial surface dark-spotted; margins ciliate. Palea ca. 10 mm long, 5 mm wide, glabrous, 13–14-nerved, 2-keeled, narrowly sulcate abaxially, the keels finely ciliate; adaxial surface shiny. Rachilla extension bristle-like, 8 mm long, with a minute rudiment. Lodicules 3, subequal, 3.2 mm long. Ovary elongate; stigmas 2, plumose, the stigmatic papillae elongate, rounded at the tips; stamens 3, the anthers 6 mm long, dark. Caryopsis 5 mm long, ca. 3 mm wide, ovoid, apically rounded, rostrate, grayish yellow, smooth; hilum linear, the embryo hardly visible.

*Phenology.* Flowering collections are known from 1941 and 1972–1974, suggesting a flowering cycle of 31–33 years.

*Distribution.* Southern Brazil.

Most collections of *Merostachys* consist of fragmentary flowering branches. The vegetative parts of the plants are nearly always omitted. Consequently, the descriptions and measurements of the leaves, branch complements, culm and culm leaves, when available, are based on flowering material; usually they are gathered from the easily reachable upper branches of the plant, which are always smaller in size and therefore less representative of the

Figure 10. *Merostachys skvortzovii* Sendulsky. —a. Flowering branch complement. —b. Gynoecium with two lodicules. —c. Stigmatic papillae with pollen grains. —d. Bisexual flower with one lodicule. —e. Lodicules. —f. Spikelet in bloom (flowering cycle 1973). —g. Apical portion of the inflorescence. —h. Lower glume. —i. Palea. —j. Lemma. —k. Upper glume. —l. Rudimentary bud attached to rachilla segment. —m. Upper portion of the branch leaf sheath and base of the blade (abaxial surface). —n. Caryopsis, embryo view. —o. Caryopsis, hilum view. —p. Culm leaf. Based on the type specimen *Skvortzov s.n.* (SP 120954).

plant as a whole. Deciduous and decaying culm leaves from basal or midculm nodes, originated during the initial growing period, are lost by the time of flowering. The plant stops producing any new vegetative organs and turns to flowering. When it is possible to find the vegetative, but complete collection, made from the same plant, the branch leaves are twice as large and the culm leaves are remarkably larger. Unfortunately, it is very seldom that a correctly identified collection displays both vegeta-

tive and flowering material. The vegetative materials, *Soderstrom 2033* (US 2909096) and *Soderstrom 2035* (US 2909100), show large culm leaves, probably of *M. skvortzovii*, under the name *M. multiramea*. The culm leaf sheaths are 25–30 cm long, 18–19 cm wide, culm leaf blades 8.5 cm long, 25 mm wide.

During the 1972–1974 flowering cycle, the flowers showed signs of being of interest to a variety of insects.

This species is named in honor of the late Boris V. Skvortzov, Professor of Botany, Chinese Forest Academy, Harbin, Manchuria, who dedicated his later years to the study of the Brazilian flora, collector of the type material, and the beloved father of the author.

*Paratypes*. BRAZIL. **Paraná:** Município Palmas, Estrada Palmas-Ponte Serrado, 5 Dec. 1971 (fl), *Hatschbach et al. 28267* (NY, SP). **São Paulo:** São Paulo, Reserva Biológica, Parque Estadual das Fontes do Ipiranga, 7 fev. 1974 (fl), *Sendulsky 1341* (SP, WIS); 10 km S of center of city of São Paulo, in grounds of the Instituto de Botânica, Parque do Estado, 10 Oct. 1973 (fl), *Sendulsky 1314* (SP), 20 Oct. 1973 (fl), *Sendulsky 1315* (SP, WIS), 6 Dec. 1973 (fl), *Sendulsky 1318* (SP, WIS), 17 Dec. 1973 (fl), *Sendulsky 1321* (SP, WIS), 17 Dec. 1973 (fl), *Sendulsky 1322* (SP, WIS), 23 Dec. 1973, *Sendulsky 1324* (SP, WIS); nativa no Jardim Botânico, 21 Oct. 1941 (fl), *Gehrt. s.n.* (SP 46002). **Rio Grande do Sul:** Município Colorado, km 251–252 on road between Carazinho and Bonambi, near Carazinho, 555 m, 30 Jan. 1973 (fl), *Soderstrom 2029* (US); Depois de Caracol, ca. 10 km N de Canela, 17 dez. 1972, *Porto, Girardi & Lindeman s.n.* (ICN); Município tenente Portela, 3 km S of Derrobadas, 31 Jan. 1973, *Soderstrom 2033* (US); Reserva Florestal do Turvo, 31 Jan. 1973, *Soderstrom 2035* (US).

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Literature Cited

Dutra, J. 1938. Les Bambusées de Rio Grande du Sud. Revista Sudamer. Bot. 5(5/6): 145–152.

Filgueiras, T. S. 1988. Bambus nativos do Distrito Federal, Brasil (Gramineae: Bambusoideae). Revista Brasil. Bot. 11: 47–66.

Hackel, E. 1909. Gramineae Novae. VI. Repertorium Specierum Novarum Regni Vegetabilis 7: 311–327.

Martius, C. F. P. von. 1840–1906. Flora Brasiliensis. . .14 volumes (in 40), published in 130 fascicles. Munich, Vienna. [Bambuseae by J. C. Doell, 1880: volume 2(3): 161–219 + plates 44–56.]

McClure, F. A. 1973. Genera of bamboos native to the New World (Gramineae: Bambusoideae). [Edited by T. R. Soderstrom.] Smithsonian Contr. Bot. 9: 1–148.

——— & L. B. Smith. 1967. Bambuseae. Pp. 1–78 *in* P. R. Reitz (editor), Flora Ilustrada Catarinense, Pt. 1 Gramineas—Suplemento. Herbario "Barbosa Rodrigues," Itajaí, Santa Catarina, Brasil.

Munro, W. 1868. A monograph of the Bambusaceae, including descriptions of all the species. Trans. Linn. Soc. London 26: 1–157, 6 plates.

Smith, L. B., D. C. Wasshausen & R. M. Klein. 1981. Gramíneas. *In:* P. R. Reitz (editor), Flora Ilustrada Catarinense, Vol. 1. Herbário "Barbosa Rodrigues," Itajaí, Santa Catarina, Brasil.

# New Combinations in North American *Schoenoplectus*, *Bolboschoenus*, *Isolepis*, and *Trichophorum* (Cyperaceae)

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ABSTRACT. Correct names are provided for Volume 11 of the *Flora of North America* for taxa segregated from *Scirpus* sensu lato. *Schoenoplectus validus* is placed in synonymy under *Sch. tabernaemontani*. New combinations made herein are: *Sch. acutus* var. *occidentalis; Sch.* ×*steinmetzii* (pro sp.; = *Sch. heterochaetus* × *tabernaemontani*); *Sch. pungens* var. *longispicatus; Sch. pungens* var. *badius* (*Scirpus americanus* subsp. *monophyllus* var. *monophyllus*, misapplied); *Sch.* ×*contortus* (= *Sch. americanus* × *pungens*); *Sch. hallii; Bolboschoenus glaucus* (Lamarck) (*Scirpus tuberosus*, misapplied); *Isolepis molesta; Trichophorum clementis;* and *T. clintonii.*

The following new combinations, synonymies, and typifications provide correct names in *Schoenoplectus*, *Bolboschoenus*, *Isolepis*, and *Trichophorum*, all segregated from *Scirpus* sensu lato (Cyperaceae) for the upcoming Volume 11 of the *Flora of North America* (Morin et al. [in prep.]). Descriptions and keys for identifying the taxa included here will be provided in the upcoming *Flora*. Types examined for this study by A. E. Schuyler, who provided me with information on them, are indicated by !Schuyler. Types that I have seen only as photocopies or photographs provided by herbarium curators or microfiches in libraries are indicated by !photo.

**1. Schoenoplectus acutus** (G. H. E. Muhlenberg ex J. Bigelow) A. Löve & D. Löve, Bull. Torrey Bot. Club 81: 33. 1954. *Scirpus acutus* G. H. E. Muhlenberg ex J. Bigelow, Fl. Boston.: 15. 1814. *Schoenoplectus lacustris* L. subsp. *acutus* A. Löve & D. Löve, Taxon 30: 849. 1981. TYPE: U.S.A. Massachusetts: Fresh Pond [near Cambridge], July 1853, Herb. William Boott, *s.n.* (neotype, GH, selected here).

I have selected as neotype the only known specimen of *Scirpus lacustris* as traditionally defined that was collected at Fresh Pond. No specimens from the Boston area that could have been seen by Bigelow have been located (Pamela White, GH, pers. comm.). Also, there is no direct evidence that Bigelow saw the Muhlenberg herbarium specimens; these add further confusion because each of the two sheets (labeled *maculatus*) in Folder 63 bears a mixed collection of seven or eight culms of *Schoenoplectus acutus*, *Sch. tabernaemontani*, and putative hybrids as described by me (Smith, 1969).

*Schoenoplectus acutus* is part of a difficult worldwide group that includes *Sch. lacustris* (L.) Palla, *Sch. tabernaemontani* (C. C. Gmelin) Palla, and *Sch. heterochaetus* (Chase) Sojak. Koyama (1962) treated the entire complex as the single species *Scirpus lacustris* and placed *Scirpus acutus* in synonymy under *Scirpus lacustris* subsp. *glaucus* (J. E. Smith) C. J. Hartman (see *Sch. tabernaemontani* below).

Two varieties are here recognized for North America:

**a. Schoenoplectus acutus** var. **acutus.**

*Scirpus lacustris* L. var. *condensatus* C. H. Peck, Rep. (Annual) Regents, Univ. State New York, New York State Mus. 53: 853. 1900. Syn. nov. *Scirpus validus* Vahl var. *condensatus* (C. H. Peck) Beetle, Univ. Wyoming Publs. 13: 6. 1948. TYPE: U.S.A. New York: [Cattaraugus Co.], Lime Lake, 5 and 20 Aug. 1899, *F. E. Fenno 17* (holotype, NYS, !Schuyler).

*Distribution.* Eastern North America.

**b. Schoenoplectus acutus** var. **occidentalis** (S. Watson) S. G. Smith, comb. nov. Basionym: *Scirpus lacustris* var. *occidentalis* S. Watson, Bot. California 2: 218. 1880. *Scirpus occidentalis* (S. Watson) Chase, Rhodora 6: 68. 1904. *Scirpus acutus* var. *occidentalis* (S. Watson) A. A. Beetle, Univ. Wyoming Publs. 13: 5. 1948. TYPE: U.S.A. New Mexico: 1851–1852, *C. Wright 1940* (mature achenes) (lectotype, NY, selected here; isolectotype, UC).

*Scirpus malheurensis* L. F. Henderson, Rhodora 32: 20. 1930. *Scirpus acutus* var. *malheurensis* (L. F. Henderson) A. A. Beetle, Univ. Wyoming Publs. 13: 5. 1948. TYPE: U.S.A. Oregon: Harney Co., in water or on wet shores of Malheur Lake, 15 July 1927, *L. F. Henderson 8655* (holotype, ORE, !Schuyler; isotype, CAS).

*Scirpus rubiginosus* A. A. Beetle, Amer. J. Bot. 28: 697. 1941. Syn. nov. *Schoenoplectus rubiginosus* (A. A. Beetle) Sojak, Čas. Nár. Mus., Odd. Přír. 140: 127. 1972. TYPE: U.S.A. California: Marin Co., along tide flat N of Stinson Beach, 9 May 1941, *Beetle & Constance 2686* (lectotype [imm.], UC, selected here, with specimen of *Sch. acutus* × *californicus* on sheet designated by Beetle as holotype; isolectotypes [imm.], CAS, GH, NY—on sheets with specimen of *Sch. acutus* × *californicus*). [Other sheets from the type collection at CAS, F, KSC, RSA, and US are *Sch. acutus* × *californicus*.]

Chase (1904: 68) included all North American *Scirpus acutus* in *Scirpus occidentalis* (S. Watson) Chase.

I have seen nine specimens that Watson annotated as *Scirpus lacustris* var. *occidentalis*. The two not cited by Chase (1904: 69) are: (1) the lectotype of *Schoenoplectus acutus* var. *occidentalis*, and (2) U.S.A. California: Sacramento Valley, Wilkes Expedition [1842], (no collector given) #*1788* (NY). Of all, only the Wright and Wilkes Expedition specimens bear achenes. I selected the *Wright 1940* specimen as the lectotype because it is typical of *Sch. acutus* var. *occidentalis* throughout its range in its lenticular achenes and mostly bifid styles, whereas the mostly trigonous achenes and mostly trifid styles of the Wilkes Expedition specimen are known only from low elevations in California.

The following collections from the type locality closely match the type collection of *Scirpus rubiginosus*: U.S.A. California: Marin Co., S end of Bolinas Lagoon ca. ½ mi. N of village of Stinson Beach, fresh water seepages at edge of tidal salt marsh. *Schoenoplectus acutus* var. *occidentalis* (achenes present): 20 Aug. 1969, *S. G. Smith 4713* (MO, PH, UC, US), 24 July 1973, *S. G. Smith 5557* (GH, NY). *Schoenoplectus acutus* × *californicus* (achenes lacking): 20 Aug. 1969, *S. G. Smith 4714* (PH, UC, US, UW), 24 July 1973, *S. G. Smith 5556* (GH, MO, NY).

For the lectotype of *Scirpus rubiginosus* I selected the specimen of *Schoenoplectus acutus* rather than the hybrid because: (1) Beetle's protologue clearly indicates that his name applies to plants correctly placed in *Sch. acutus* rather than in the hybrid; and (2) Beetle described the achenes, which are lacking in the type specimens collected in May but are present in my collections of *Sch. acutus*, cited above, collected in July and August.

**2. Schoenoplectus tabernaemontani** (C. C. Gmelin) Palla, Verh. K. K. Zool.-Bot. Ges. Wien 38, Sitzb.: 49. 1888. Basionym: *Scirpus tabernaemontani* C. C. Gmelin, Fl. Bad. 1: 101. April or May 1805. *Scirpus lacustris* L. subsp. *tabernaemontani* (C. C. Gmelin) Syme, Engl. Bot. ed. 10, 3: 63. 1870. *Scirpus lacustris* var. *tabernaemontani* (C. C. Gmelin) Doell, Rhein. Fl. 165. 1943. *Schoenoplectus lacustris* subsp. *tabernaemontani* (C. C. Gmelin) Löve & Löve, Folia Geobot. Phytotax. 10: 275. 1975. TYPE: Europe: in Rheni vivinia (holotype, KR, !photo, det. on sheet by Schuyler in 1974).

*Scirpus validus* Vahl, Enum. Pl. 2: 268. Oct. 1805 or later. *Scirpus lacustris* var. *validus* (Vahl) Kukenthal, Feddes Repert. 23: 200. 1926 or 1927. *Schoenoplectus validus* (Vahl) A. Löve & D. Löve, Bull. Torrey Bot. Club 81: 33. 1954. *Scirpus lacustris* subsp. *validus* (Vahl) T. Koyama, Canad. J. Bot. 40: 927. 1962. *Schoenoplectus lacustris* (L.) Palla subsp. *validus* (Vahl) T. Koyama, Occas. Pap. Pauahi Bishop Mus. 29: 128. 1989. TYPE: e Caribaeis ded. Dr. Banks, *Herb. Vahl s.n.* (holotype, C, !photo, !Schuyler).

*Scirpus glaucus* J. E. Smith, Engl. Bot. 33, pl. 2321. 1811. nom. illeg., not *Scirpus glaucus* Lamarck, Tabl. Encycl. 1: 142. 1791. *Scirpus lacustris* subsp. *glaucus* (J. E. Smith) C. J. Hartman, Sv. Norsk Exc.-Fl.: 10. 1846. *Schoenoplectus lacustris* (L.) Palla subsp. *glaucus* (J. E. Smith) Becherer, Feddes Repert. 25: 11. 1928. TYPE: Scotland. Galloway, on the sides of a saltmarsh on the W of Ardbigland, 1800, *J. Mackay 6* (lectotype, LINN—Herb. Smith 105.25, selected here, !photo, det. by Clive Jermy (BM)).

*Scirpus tabernaemontani* forma *luxurians* Miquel, Ann. Mus. Bot. Lugd.-Batav. 2: 143. 1865. *Scirpus lacustris* subsp. *validus* var. *luxurians* (Miquel) T. Koyama, Canad. J. Bot. 40: 927. 1962. *Scirpus lacustris* subsp. *creber* var. *luxurians* (Miquel) T. Koyamya, Phytologia 8: 458. 1963. *Schoenoplectus validus* subsp. *luxurians* (Miquel) Sojak, Čas. Nár. Mus., Odd. Přír. 141: 62. 1972. TYPE: Japan. In ripa fluminis Jahaki, Gawa ins Nippon, #*633* (lectotype, L, selected here—not seen, !Schuyler).

*Scirpus validus* var. *creber* Fernald, Rhodora 45: 283. 1943. *Schoenoplectus validus* (M. Vahl) A. Löve & D. Löve var. *creber* (Fernald) A. Löve & D. Löve, Bull. Torrey Bot. Club 81: 33. 1954. *Scirpus validus* subsp. *creber* (Fernald) T. Koyama, Phytologia 8: 458. 1963. *Schoenoplectus lacustris* subsp. *creber* (Fernald) A. Löve & D. Löve, Taxon 30: 849. 1981. TYPE: U.S.A. New York: Fisher's Island, 10–15 Aug., *H. St. John 2581* (holotype, GH).

The typification of *Scirpus glaucus* J. E. Smith is important because it is the basionym for the above widely used names *Scirpus lacustris* subsp. *glaucus* and *Schoenoplectus lacustris* subsp. *glaucus*. Nich-

olas Turland (BM, pers. comm. 1994) provided the following information: Neither the collection by Borrer from Sussex, England, used to produce the illustration of *Scirpus glaucus* in *English Botany*, nor any material from Norfolk, England, as mentioned in the protologue to plate 2321, appears to exist at BM. The only other specimen mentioned in the protologue is *Mackay 6*, which was examined for me by Clive Jermy (BM); it has bifid styles and dark brown papillae on the floral scales and is a typical example of northwestern European *S. tabernaemontani*.

My studies and those of A. E. Schuyler (pers. comm.) indicate that *Schoenoplectus tabernaemontani* and *Sch. validus* are definitely conspecific. They differ by very few characteristics and intergrade completely in both North America and Eurasia. When Raymond (1957: 140) united these two species he expressed doubts: "I have tentatively referred [a single specimen from Indo-China] to *S. tabernaemontani*. . . . *S. tabernaemontani* and *S. validus* are very closely related if not conspecific." Koyama (1962) combined European *S. tabernaemontani* with the North American *S. acutus* Muhlenberg ex Bigelow in *S. lacustris* L. subsp. *glaucus* (J. E. Smith) C. J. Hartman, placed Western Hemisphere and Hawaiian plants in *S. lacustris* L. subsp. *validus* (M. Vahl) T. Koyama var. *validus*, and placed Asian *S. tabernaemontani* in *S. lacustris* subsp. *validus* var. *luxurians* (Miquel) T. Koyama. Later, however, Koyama (1978: 209) treated *S. tabernaemontani* and *S. validus* as separate but doubtfully distinct species each occurring in both North America and Eurasia. The known distribution of *Sch. tabernaemontani* as here treated is the boreal to tropical zones of most of Eurasia and North America, the Caribbean, parts of Africa and temperate South America, the Hawaiian and other Pacific Islands, Australia, and New Zealand. Variation in *Sch. tabernaemontani* sensu lato is complex, and my attempts to clearly delimit infraspecific taxa have led me to the opinion that delimitation of infraspecific taxa is premature. Northwestern European plants have densely to sparsely reddish scabrous floral scales, especially near the bases of the spikelets; I have seen very similar plants from scattered localities in northern Canada, along both Atlantic and Pacific coasts of North America, and southern Africa. *Scirpus validus* var. *creber* is distinguished only by its short floral scales, which partially expose the achenes, and intergrades with forms with longer scales over most of North America, and I have seen similar forms from northwestern Europe.

**3. Schoenoplectus ×steinmetzii** (Fernald) S. G. Smith (pro sp.), comb. nov. Basionym: *Scirpus steinmetzii* Fernald, Rhodora 45: 286 and plate 766. 1943. TYPE: U.S.A. Maine: Penobscott County, bank of Passadumkeag Stream [ca. 2 mi. E of the village of], Passadumkeag, 12 Aug. 1937, *F. H. Steinmetz 355* (holotype, GH; isotypes, MAINE, NY, US).

I consider *Schoenoplectus ×steinmetzii* to be a hybrid between *Schoenoplectus heterochaetus* (Chase) Sojak and *Schoenoplectus tabernaemontani* (C. C. Gmelin) Palla.

Koyama (1962: 927) placed *Scirpus steinmetzii* in synonymy under *S. lacustris* subsp. *validus* (Vahl) T. Koyama var. *validus* and treated *S. heterochaetus* Chase as *S. lacustris* subsp. *lacustris* var. *tenuiculmis* (Sheldon) T. Koyama.

*Scirpus steinmetzii* has previously been reported only from Passadumkeag Stream in the immediate vicinity of the type locality, where the plants in the several known colonies are very similar to each other and are intermediate between *Schoenoplectus heterochaetus* and *Sch. tabernaemontani* in leaf, culm air cavity, floral scale, style, achene, and perigonial bristle characters. The protologue of *S. steinmetzii* erroneously describes the styles as bifid, the perigonial bristles as 0–2, and the achenes as planoconvex. The plants at the type locality produce very few achenes, in which the seeds are often aborted, and most of the pollen grains are abnormal when stained by cotton blue in lacto-phenol (confirmed by Arthur Haines, MAINE, pers. comm. 1994). Although *Sch. tabernaemontani* is common in the immediate vicinity of the type locality, the closest known stations of *Sch. heterochaetus* are each ca. 360 km distant (Lake Champlain and vicinity, where it is common and hybridizes with *Sch. acutus*, and eastern Massachusetts, where it may be extirpated). The region of the type locality, however, includes vast roadless areas with numerous wetlands that have been little explored botanically.

Other specimens from Ontario, Quebec, Iowa, Massachusetts, New York, Minnesota, and Wisconsin are similar to specimens from the type population, but identification of most is uncertain because they lack achenes. The following collection from a population I have studied is nearly indistinguishable from specimens from the type population except that it produces many achenes containing fully formed seeds: U.S.A. Wisconsin: Rock Co., ca. 1.5 mi. SW of Lima Center along Wis. Hwy. 59, T4N, R14E, section 29, many clones in ca. 1 m of water,

in undrained depression with *Schoenoplectus heterochaetus* and *Sch. tabernaemontani*, 26 Aug. 1993, *S. G. Smith 5208* (GH, MAINE, NU, WIS).

**4. Schoenoplectus pungens** (M. Vahl) Palla, Bot. Jahrb. Verh. K. K. Zool.-Bot. Ges. Wien 38, Sitzb.: 49. 1888. Basionym: *Scirpus pungens* M. Vahl, Enum. Pl. 2: 255. 1805. TYPE: Europe?: Erhart misit, *herb. Vahl s.n.* (holotype, C, !photo, !Schuyler).

*Schoenoplectus pungens* was long known by the name *Scirpus americanus* Persoon, misapplied (*Schoenoplectus americanus* (Persoon) Volkart ex Schinz & R. Keller). The type of *Scirpus americanus* Persoon is conspecific with plants long known by the later synonym *Scirpus olneyi* A. Gray but correctly known as *Sch. americanus* (Schuyler, 1974).

I agree with Koyama (1963) that North American and European *Schoenoplectus pungens* can be divided into three varieties, although the characteristics of these are somewhat different from those he gave, and in my opinion the differences are too small for the recognition of subspecies.

**4a. Schoenoplectus pungens** var. **pungens.**

Synonymy and distribution as given by Koyama (1963: 1117) for *Scirpus americanus* Persoon subsp. *americanus* var. *americanus*.

**4b. Schoenoplectus pungens** var. **longispicatus** (N. L. Britton) S. G. Smith, comb. nov. Basionym: *Scirpus americanus* Persoon var. *longispicatus* N. L. Britton, Trans. New York Acad. Sci. 11: 78. 1892. *Scirpus longispicatus* (N. L. Britton) Smyth, Trans. Kansas Acad. Sci. 16: 163. 1899. *Schoenoplectus americanus* subsp. *longispicatus* (N. L. Britton) Sojak, Čas. Nár. Mus., Odd. Přír. 141: 62. 1972. *Scirpus pungens* var. *longispicatus* (N. L. Britton) Cronquist, Intermountain Flora 6: 74. 1977. *Schoenoplectus pungens* subsp. *longispicatus* (N. L. Britton) A. Löve & D. Löve, Taxon 30: 849. 1981. TYPE: U.S.A. New Mexico: 1851 or 1852, *C. Wright 1963* (lectotype, NY, selected here, !Schuyler; isolectotypes, PH, US, GH 2 sheets).

*Scirpus solispicatus* Lunell, Amer. Midl. Naturalist 4: 230. 1915. TYPE: U.S.A. North Dakota: Benson Co., Butte, 18 Aug. 1907, *J. Lunell s.n.* (lectotype, MIN, selected here, !Schuyler).

The lectotype sheet of *Schoenoplectus pungens* var. *longispicatus*, and the isolectotype sheets at US and GH, all bear mixed collections of *Schoenoplectus pungens* and putative *Sch. americanus* × *pungens* hybrids; and sheet #28000 at GH also bears a specimen of *Sch. americanus* (which a note handwritten on the sheet suggests belongs to a collection from Nevada distributed by Wheeler in 1871). I selected the specimens of *Sch. pungens* as the lectotypes because they are typical of most western North American *Sch. pungens* and bear mature achenes, which are described in the original description, whereas the putative hybrid specimens are intermediate between *Sch. americanus* and *Sch. pungens* and lack achenes. The other collection (Colorado: Platte R., *Dr. Geo. Smith*) that Britton cited in the protologue has not been located.

Three other specimens of *Scirpus solispicatus* collected by Lunell at Butte in 1906 (GH, MIN, NY) are very similar to the lectotype of *Scirpus solispicatus*, which I chose because of its mature achenes with intact bristles.

*Schoenoplectus pungens* var. *longispicatus* is composed of at least the North American plants included by Koyama (1963: 1118) in *Scirpus americanus* Persoon subsp. *americanus* var. *longispicatus* (N. L. Britton) T. Koyama.

**4c. Schoenoplectus pungens** (M. Vahl) Palla var. **badius** (K. Presl) S. G. Smith, comb. et stat. nov. Basionym: *Scirpus badius* K. Presl, Reliq. Haenk. 1: 193. 1828. TYPE: U.S.A. California: hab. ad Monte-Rey, *Haenke s.n.* (holotype, PR, !Schuyler).

*Schoenoplectus pungens* var. *badius* is composed of at least the North American plants included in *Scirpus americanus* subsp. *monophyllus* (K. Presl) T. Koyama var. *monophyllus* (Koyama, 1963: 1118).

My examination of the types and original descriptions indicate that *Scirpus badius* K. Presl rather than *Scirpus monophyllus* K. Presl is the correct basionym for a taxon including the North American Pacific Coastal plants of *Schoenoplectus pungens*. Koyama (1963) placed *Scirpus badius* in synonymy under *Sch. americanus* subsp. *monophyllus* var. *monophyllus*, based on *Scirpus monophyllus* K. Presl, Reliq. Haenk. 1: 193. 1828, TYPE: Peru: Montana Peruvia, *Haenke s.n.* (holotype, PR, !Schuyler). All three specimens on the type sheet of *S. monophyllus* (photo in Koyama, 1963) are typical of *Sch. americanus* rather than

the Pacific Coastal North American *Sch. pungens* in their leaves, floral scales, achenes, and perigonial bristles. The styles are a mixture of bifid and trifid, which can occur in either species. The culms, however, have more-or-less flat sides and are very firm, retaining their trigonous shape on pressing, which is fairly common in *Sch. pungens* but rare in *Sch. americanus*, in which the culm sides are typically deeply concave and readily flattened on pressing. Except for the style number, the pertinent parts of the original description of *Scirpus monophyllus*, "Colmo triquetro inferne monophyllo, . . . stylo bifido, . . . caryopsidem obovatum plano-convexam . . ." agree with the type. Thus, the name *Scirpus monophyllus* K. Presl applies to plants belonging to *Schoenoplectus americanus* rather than to *Sch. pungens*.

In the case of *Scirpus badius*, the type is a fine specimen with a rhizome and four complete shoots bearing inflorescences with some intact styles and mature achenes. It is an excellent example of the North American Pacific Coastal plants of *Schoenoplectus pungens*. The original description of *S. badius*, which reads in part: "Colmo triquetro foliato, . . . stylo trifido, . . . Setae sex retrorsum scabrae, caryopsidae una quarta parte breviores. Caryopsis obovata trigona. . . ," agrees well with the type.

**5. Schoenoplectus ×contortus** (E. H. Eames) S. G. Smith, comb. nov. Basionym: *Scirpus olneyi* A. Gray var. *contortus* E. H. Eames, Rhodora 9: 220. 1907. *Scirpus ×contortus* (E. H. Eames) T. Koyama, Canad. J. Bot. 41: 1123. 1963. TYPE: U.S.A. Connecticut: Milford, plentiful in a brackish marsh at Pond Point, 28 Sep. 1907, *E. H. Eames 5847* (holotype, GH, ex herb. Eames; isotype, MO).

**6. Schoenoplectus hallii** (A. Gray) S. G. Smith, comb. nov. Basionym: *Scirpus hallii* A. Gray, Man. ed. 3, addend.: xcvii. 1862. *Scirpus supinus* L. var. *hallii* (A. Gray) A. Gray, Man. ed. 5: 563. 1867. *Scirpus uninodis* (Delile) Boissier var. *hallii* A. A. Beetle, Amer. J. Bot. 29: 656. 1942. TYPE: U.S.A. Illinois: Mason Co. or Menard Co., wet banks of pond, [Aug. 1860 or 1861], *E. Hall [& D. Vasey & M. S. Bebb?] s.n.* (holotype, GH).

Raynal (1976: 141) placed *Schoenoplectus hallii* in synonymy under *Sch. erectus* (Poiret) Palla ex J. Raynal.

The type locality, date, names of collectors, and number of collections are all in doubt, as indicated by differences among the protologue, Gray's annotation on the holotype, labels on the holotype and several possible isotypes (F, NY, US), and a letter from Gray [to Torrey?] at NY.

**7. Bolboschoenus glaucus** (Lamarck) S. G. Smith, comb. nov. Basionym: *Scirpus glaucus* Lamarck, Tabl. Encycl. 1: 142. 1791. *Scirpus maritimus* L. [var.] *glaucus* (Lamarck) Nees in Wight, Contr. Bot. India 111. 1834. TYPE: Senegal, herb. Lamarck sheet 673/14, *Roussillon s.n.* (holotype, P, !photo, !Schuyler; det. as *Scirpus maritimus* L. by J. Raynal in 1966).

Examination of types and protologues indicates that *Scirpus glaucus* Lamarck is the correct name for the species to which Beetle (1942: 85) and Koyama (1962: 936) misapplied the later name *Scirpus tuberosus* Desfontaines, Fl. Atlant. 1: 50. 1798; synonym: *Scirpus maritimus* L. [var.] *tuberosus* (Desfontaines) Roemer & Schultes, Syst. Veg. 2: 139. 1817; *Reigera maritimus* [var.] *tuberosus* (Desfontaines) Opiz, Seznam: 83. 1852; *Bolboschoenus tuberosus* (Desfontaines) Hadac, Bull. Coll. Sci. Baghdad 6: 13. 1961. The type of *S. tuberosus*, [Algeria]: habitat in lacubus prope La Calle, Herbier de la Flore Atlantique donne au Museum, par M. Desfontaines, *s.n.* (holotype, P, !photo; det. as *Scirpus maritimus* L. by A. E. Schuyler in 1966), is probably *S. maritimus* or a close relative in having most of the spikelets in a sessile mass, bifid and trifid styles, and lenticular achenes. The protologue, which reads in part: "spiculis congestis. . .sessilibus aut brevio pedunculatis," agrees with the type. However, the type of *S. glaucus* is typical of the entity sometimes known as *S. tuberosus* in its achenes and trifid styles (Schuyler, pers. comm.) and its paniculate inflorescence with most of the spikelets on rays. The protologue of *S. glaucus*, which reads in part "umbella composita subpaniculata, spiculis pedicellatis," agrees with the type.

*Bolboschoenus glaucus* is widely confused with *Scirpus maritimus* L. (*Schoenoplectus maritimus* (L.) Lye, *Bolboschoenus maritimus* (L.) Palla). Its achenes were described by Browning & Gordon-Gray (1993) under "*Bolboschoenus maritimus* entity 2." It is widespread in the warmer parts of the Old World and sparingly introduced into North America.

**8. Isolepis molesta** (M. C. Johnston) S. G. Smith, comb. nov. Basionym: *Scirpus molestus* M. C. Johnston, Southw. Naturalist 9: 310. 1964. TYPE: U.S.A. Texas: Walker Co., Huntsville, 27 Apr. 1944, *S. R. Warner 20,000* (holotype, TEX not seen, !Schuyler).

**9. Trichophorum clementis** (M. E. Jones) S. G. Smith, comb. nov. Basionym: *Scirpus clementis* M. E. Jones, Contr. W. Bot. 14: 21. 1912. TYPE: U.S.A. California: Rae Lake, King's River, alpine, 20 July 1910, *Mrs. Clements s.n.* (lectotype, selected here, POM 111694, !Schuyler; isolectotypes, DS, POM 111695).

*Scirpus yosemitanus* F. J. Smiley, Univ. Calif. Publ. Bot. 9: 108. 1921. TYPE: U.S.A. California: Yosemite National Park, Tuolumne Meadows, soda springs, 8 Aug. 1898, *J. W. Congdon s.n.* (holotype, GH).

**10. Trichophorum clintonii** (A. Gray) S. G. Smith, comb. nov. Basionym: *Scirpus clintonii* A. Gray, Amer. J. Sci., ser. 2, 38: 290. 1864. TYPE: U.S.A. New York: between Buffalo and Williamsville, June 1864, *G. W. Clinton s.n.* (holotype, GH, !Schuyler; isotypes, NY, !Schuyler; US, not seen; K not seen, !Schuyler). Two possible isotypes at F bear insufficient data.

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Literature Cited

Beetle, A. A. 1942. Studies in the genus *Scirpus* L. IV. The section *Bolboschoenus* Palla. Amer. J. Bot. 42: 82–88.

Browning, J. & K. D. Gordon-Gray. 1993. Studies in the Cyperaceae in southern Africa. 21: The taxonomic significance of the achene and its embryo in *Bolboschoenus*. S. African J. Bot. 59: 311–318.

Chase, A. 1904. The North American allies of *Scirpus lacustris*. Rhodora 6: 65–71.

Koyama, T. 1962. The genus *Scirpus* Linn. Some North American aphylloid species. Canad. J. Bot. 40: 913–937.

———. 1963. The genus *Scirpus* Linn. Critical species in the section *Pterolepis*. Canad. J. Bot. 41: 1107–1131.

———. 1978. Cyperaceae. *In:* Hui-Lin Liu et al. (editors), Flora of Taiwan. Vol. 5: 191–372. Epoch Publishing, Taipei, Taiwan.

Morin, N. R., Convening Editor, and Flora of North America Editorial Committee. [In prep.] Flora of North America. Vol. 11. Oxford Univ. Press, New York.

Raymond, M. 1957. Some new or critical *Scirpus* from Indo-China. Le Naturaliste Canadien 84: 111–149.

Raynal, J. 1976. Notes Cyperologiques: 26. Le Genre *Schoenoplectus* II. L'amphicarpie et la sect. *Supini*. Adansonia, ser. 2, 16: 119–155.

Schuyler, A. E. 1974. Typification and application of the names *Scirpus americanus* Pers., *S. olneyi* Gray, and *S. pungens* Vahl. Rhodora 76 (805): 51–52.

Smith, S. G. 1969. Natural hybridization in the *Scirpus lacustris* complex in North Central United States. Pp. 175–199 *in* J. E. Gunckel (editor), Current Topics in Plant Science. Academic Press, New York and London.

# A New *Nerine* Species (Amaryllidaceae tribe Amaryllideae) from the Koup Karoo, South Africa

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ABSTRACT. *Nerine marincowitzii* is a rare new species from the Koup Karoo, Cape Province, South Africa. Most closely related to the eastern Cape *N. huttoniae* Schonland, *N. marincowitzii* is distinguished by hysteranthous leaves, a sigmoid scape that detaches at ground level when dry, flowers that turn brown at senescence, and a wind-dispersed infructescence. It grows on exposed seasonal washes and flowers at the end of the autumn rainfall season in May.

*Nerine* Herbert (1820), comprising approximately 22 species, is a horticulturally important southern African genus of Amaryllideae (Dahlgren et al., 1985). Of the ten genera in this mainly sub-Saharan African tribe, *Nerine* is most closely allied to *Brunsvigia* Heister (1755), sharing with it apomorphic fasciculate stamens. Traub (1967) has suggested that the two genera should be united. Until strong phylogenetic evidence for this becomes available, however, *Nerine* is retained as a distinct genus. *Nerine* is distinguished from *Brunsvigia* by somewhat smaller flowers, mostly with undulate tepal margins, and distintegrating, globose, membranous capsules with bulging, exposed seeds (Dyer, 1976).

Traub (1967) recognized four sections in *Nerine*. Section *Laticomae* Traub, the most widespread in southern Africa, comprises species with short, stout scapes whose length more or less approximates the width of the flower cluster. According to Obermeyer (1993) the section includes two species, *N. laticoma* (Ker-Gawler) Durand & Schinz and *N. huttoniae* Schonland. The newly described *N. marincowitzii* (Fig. 1) adds a further species to section *Laticomae*.

*Nerine marincowitzii* was collected southeast of Leeu-Gamka in the Koup Karoo, Cape Province, widely disjunct from *N. laticoma* and *N. huttoniae* (Fig. 2). Unlike the highly seasonal summer rainfall region occupied by these two species, the semiarid area occupied by *N. marincowitzii* has an extended rainfall season, and although annual precipitation in the area is low and highly variable it benefits from summer and autumn rainfall (Zucchini & Adamson, 1984).

*Nerine marincowitzii* is distinguished from *N. laticoma* and *N. huttoniae* by hysteranthous, narrow leaves (3–4 mm wide), a scape that is elliptical rather than compressed in transverse section, and by plane-edged tepals. The new species is most similar to *N. huttoniae* and shares with it a many-flowered inflorescence (up to 40 flowers) and rigid, widely radiating pedicels, which bestow a hemispherical shape on the flower head. *Nerine marincowitzii* is unique in the genus in having an apomorphic curved scape and tepals that turn brown and remain outspread with age. These specialized floral changes also occur in the closely allied *Hessea* Herbert and differ from the usual pattern of senescence in Amaryllideae, where the floral pigmentation becomes accentuated and the tepals ultimately collapse (Snijman, 1994).

The wind-dispersed infructescence of *Nerine marincowitzii* is a further specialization not before known in *Nerine*. When dry, the scape detaches at ground level, the curvature of the scape confers a somewhat spherical configuration on the infructescence, and the entire structure tumbles away in the wind. This derived mechanism, known as anemogeochory and reported to occur in arid areas worldwide (Van der Pijl, 1982), is also well developed in *Brunsvigia*, *Boophone* Herbert, and *Cybistetes* Milne-Redhead & Schweickerdt in Amaryllideae (Snijman & Williamson, 1994).

**Nerine marincowitzii** Snijman, sp. nov. TYPE: South Africa. Cape Province: 3222 (Beaufort West) Koup Karoo, farm Vredendal, SE of Leeu-Gamka, in washes along Kleinwatervalrivier (CD), 19 May 1990, *Snijman 1245* (holotype, NBG; isotypes, MO, PRE). Figure 1.

Inter species sectionis *Laticomarum* Traub inflorescentia multiflora (floribus usque 40) et pedicillis rigidis radiatim ad *Nerine huttoniam* Schonland accedens sed foliis hysteranthis, scapo sigmoideo, floribus brunneis aetate provecta et infructescentia anemodispersa ab ea recedens.

Plants small, to 20 cm high. *Bulb* solitary, depressed-globose, 45–55 mm across, covered with

Figure 1. *Nerine marincowitzii* Snijman. —1. Inflorescence. —2. Mature leaves. —3. Mature bulb. —4. Flower at anthesis. —5. Anther after dehiscence. —6, 7. Dorsifixed anthers before dehiscence. —8. Mature seeds in disintegrating capsule. Scale bars: 1–3, 8 = 2 cm; 4 = 7 mm; 5–7 = 3 mm. Original painting by E. Ward-Hilhorst from *Vlok s.n.*

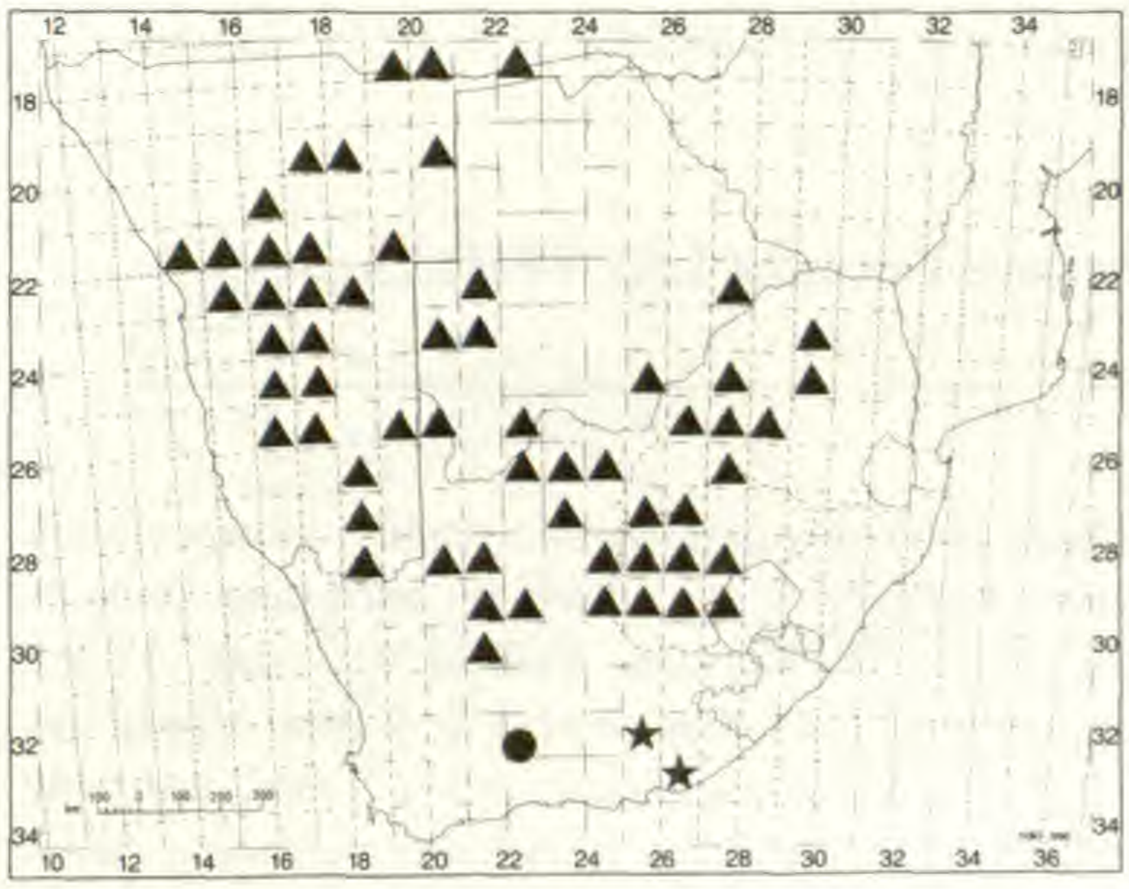


Figure 2. Known distribution of *Nerine* sect. *Laticomae*: *N. laticoma* (▲), *N. huttoniae* (★), *N. marincowitzii* (●).

thinly fibrous tunics, cream-colored and fleshy within, extended into a slender neck to 60 mm long. *Foliage leaves* 5–6, absent at anthesis, distichous, suberect to recurved, narrowly ligulate, tapering gradually distally, canaliculate, somewhat succulent, to 30 cm × 3–4 mm, bright green, glabrous. *Inflorescence* 20–40-flowered, hemispherical, compact, 10–16 cm across; scape sigmoid, rigid, elliptical in cross section, 11–14 cm × 2.5–3.5 mm, reddish brown, breaking at ground level when dry; spathe valves 2, narrowly lanceolate, 35–55 × 3–5 mm, papery, wine-red; bracteoles filiform, to 10 mm long; pedicels radiating widely, straight, terete, 40–75 mm long, shiny green, turning straw-colored and rigid in fruit. *Perigone* strongly zygomorphic, pink, initially with whitish throat, aging to brown, scentless; tepals shortly connate proximally, oblong-lanceolate, falcate and upturned at anthesis, 17–22 × 4–6.5 mm, plane; filaments slightly declinate, filiform, 13–17 mm long, expanded and connate proximally into a short tube to 0.25 mm long; anthers dorsifixed, ca. 5 mm long and wine-red before opening; pollen whitish. *Ovary* dark wine-red; ovules 1 or rarely 2 per locule, absent from innermost flowers; style slender, declinate, ca. 20 mm long; nectar present around style base; stigma shortly trilobed. *Capsule* small, papery, loculicidally dehiscent, rapidly outgrown by seeds. *Seeds* ellipsoidal, succulent, 6–7 mm across, wine-red; testa with stomata.

*Phenology*. Flowering is limited to approximately three weeks in May depending on the advent of rain in autumn (probably until the end of April). The leaves appear in spring when growth is rapid and die back during a dry spell in summer.

*Distribution and habitat*. *Nerine marincowitzii* is known from a single population about 40 kilometers southeast of Leeu-Gamka, near the Kleinwatervalrivier, a tributary of the Gamka River. The population, comprising approximately 400 plants, is confined to sparsely vegetated, seasonal washes with a north aspect, where the bulbs are lodged in light clay soil, covered with sharp blue-gray slate chips.

*Etymology*. The specific epithet honors C. P. Marincowitz of the farm Kleinsleutelfontein, Koup Karoo, whose original knowledge and appreciation of this remarkable species led to its identification as new.

*Paratype*. SOUTH AFRICA. **Cape:** 3222 (Beaufort West) Koup Karoo, farm Vredendal, SE of Leeu-Gamka (CD), 10 May 1992, *Vlok s.n.* (NBG).

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Literature Cited

Dahlgren, R. H. T., H. T. Clifford & P. F. Yeo. 1985. The Families of the Monocotyledons. Springer-Verlag, Berlin.

Dyer, R. A. 1976. Amaryllidaceae. Pp. 947–954 *in* R. A. Dyer (editor), The Genera of Southern African Flowering Plants 2. Department of Agricultural Technical Services, Pretoria.

Heister, L. 1755. Beschreibung eines neuen Geschlechts. Waysenhause, Braunschweig.

Herbert, W. 1820. *Nerine rosea*. Rose-coloured *Nerine* *in* J. Sims (editor), Bot. Mag. 47: 2124. Sherwood, Neely & Jones, London.

Obermeyer, A. A. 1993. *Nerine* Herb. P. 162 *in* T. H. Arnold & B. C. De Wet (editors), Plants of Southern Africa: Names and Distribution. Mem. Bot. Survey S. Africa 62.

Snijman, D. A. 1994. Systematics of *Hessea*, *Strumaria* and *Carpolyza* (Amaryllideae: Amaryllidaceae). Contrib. Bolus Herb. 16: 1–162.

——— & G. Williamson. 1994. A taxonomic re-assessment of *Ammocharis herrei* and *Cybistetes longifolia* (Amaryllideae: Amaryllidaceae). Bothalia 24: 127–132.

Traub, H. P. 1967. Review of the genus *Nerine* Herb. Pl. Life 23: 3–32.

Van der Pijl, L. 1982. Principles of Dispersal in Higher Plants. Springer-Verlag, Berlin.

Zucchini, W. & P. J. Adamson. 1984. The Occurrence and Severity of Droughts in South Africa. Water Research Commission Report No. 91/1/1984. Department of Civil Engineering, University of Stellenbosch.

# Two New Species of Combretaceae from Puntarenas, Costa Rica

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ABSTRACT. Two new species of Combretaceae are described from Costa Rica. *Combretum graciliflorum* is related to *C. cacoucia* Exell and is only the second species of section *Cacoucia* (Aublet) Engler & Diels known in America. *Buchenavia costaricensis* is the second species of the genus from Central America and is evidently not closely related to the other (*B. tetraphylla* (Aublet) R. A. Howard). *Combretum assimile* Eichler is also reported as new to Costa Rica, from the same area as the above two new species (Osa Peninsula, Puntarenas).

Among specimens collected in Costa Rica in 1988–1991 and recently sent to me for naming by the Missouri Botanical Garden are three taxa new to Costa Rica, two of them new to science. The two latter are the first new Central American Combretaceae to be discovered for many years, indicating the need for further detailed studies of the area in question (Osa Peninsula, Puntarenas).

**Combretum graciliflorum** Stace, sp. nov. TYPE: Costa Rica. Puntarenas: Cantón de Osa/Buenos Aires, W part of main ridge of Fila Retinto, along and near trail from Palmar Norte to Jalisco, 8°59.5′N, 83°28′W, 780–960 m, 9 Dec. 1988, *Grayum & Herrera 9131* (holotype, MO).

A speciebus consectionibus floribus extra dense pubescentibus minoribus angustioribusque differt. Pedicelli 3–7 mm; hypanthium inferius (cum ovario) 3–4 mm; hypanthium superius anguste curvato-infundibuliforme 10–17 mm longum (sepalis 2.5–3.5 mm longis inclusis), 3.5–6 mm latum; petala usque ad 3 mm exserta, ca. 7 × 5 mm, late elliptica.

Liana. Minute stalked glands frequent on leaves and inflorescences. Leaves opposite, 3.5–11.5 × 2.5–6 cm, ovate-oblong, abruptly and shortly acuminate at apex, cordate to rounded-cordate at base, with 5–6 pairs of strongly curved lateral veins, densely reddish brown appressed-pubescent on veins, otherwise sparsely pubescent. Petiole 3–6 mm, densely reddish brown appressed-pubescent. Inflorescence a simple, terminal raceme 6–14.5 cm (not fully elongated). Young stems, rachis, bracts, and outside of flowers densely reddish brown appressed-pubescent. Lowest bracts ca. 14 × 5 mm, narrowly elliptic, decreasing in size acropetally. Flowers (from base of pedicel to tip of petals, excluding stamens and style) 18–28 mm. Pedicel 3–7 mm. Lower hypanthium (including ovary) 3–4 mm. Upper hypanthium (including sepals) 10–17 mm, narrowly curved-infundibuliform, gradually widening from base, 3.5–6 mm across at base of sepals. Sepals 2.5–3.5 × 2–3 mm, triangular, acute at apex. Petals ca. 7 × 5 mm, broadly elliptic, pubescent, subacute at apex, exceeding sepals by up to 3 mm. Stamens exserted (but broken off). Style exserted at least 10 mm when mature.

The label describes the plant as a coarse liana swooping low in forest, with yellowish green petals. However, the petals have dried very dark, and they and the stamens may have been red, as in most members of the same section; the collectors might have been referring to the sepals.

I have seen only one sheet of this species, but it is clearly a member of section *Cacoucia* (Aublet) Engler & Diels (Exell, 1953). This section contains one American species (*C. cacoucia* Exell) and probably four species in West Africa (Fig. 1). *Combretum graciliflorum* is readily separable from *C. cacoucia* because of its much narrower flowers, and comes closer to some of the West African species in flower shape, notably *C. mooreanum* Exell, *C. stenopterum* Exell, and some plants of *C. bracteatum* (M. A. Lawson) Engler & Diels (especially plants formerly segregated as *C. gentilii* De Wildeman). However, it is distinct from all of these in details of flower structure. The flowers of section *Cacoucia* are the largest and most highly developed in the genus, with a long curved upper hypanthium, attaining 4.5 cm long in some plants of *C. bracteatum* (e.g., the type specimen of *C. buccinifloruum* Exell). They are mostly red or orange in color, have long-exserted stamens and style, and are probably bird-pollinated. The flowers of the new *C. graciliflorum* are the smallest in the section.

The fruits of the West African species of the genus are 5-winged, the wings being wide and thin in *C. bracteatum* (including *C. gentilii* and *C. buccinifloruum*) and *C. platypterum* (Welwitsch) Hutchinson & Dalziel, and very narrow and corky in *C. stenopterum* and *C. mooreanum*. In contrast, the

Figure 1. Distribution of *Combretum* sect. *Cacoucia*. African range covers four species; it coincides closely with the original area of tropical rainforest. American range covers *C. cacoucia* and (●) *C. graciliflorum* sp. nov. Continents are drawn to the same scale and correct relative latitudes.

fruits of *C. cacoucia* are larger (5–8 × 1.7–3 cm) and unwinged, with five strong longitudinal ridges. It is thus very desirable that fruiting material of *C. graciliflorum* be discovered. If it is a riverine species, like the three last-mentioned, then it too probably has ridged or very narrowly winged fruits.

**Buchenavia costaricensis** Stace, sp. nov. TYPE: Costa Rica. Puntarenas: Reserva Forestal Golfo Dulce Aguabuena, Sector Cuenca Oeste, 8°42′2″N, 83°31′30″W, 50–150 m, 28 Sep. 1991, *Aguilar 502* (holotype, MO; isotypes, CR, LTR).

Ab aliis speciebus petiolis longis (1.3–3.5 cm longi) gracilibus (laminae saepe solum duplo longae), inflorescentiae elongato-spicatae, fructibus glabris (apice subacuto ad rotundato), hypanthiis superis extus glabris, foliis maturis glabris, hypanthiis inferis rhachidibusque sparse pubescentibus differt.

Tree to 35 m, with long, thin, straight buttresses. Leaves spirally arranged, crowded on branchlet tips; lamina 2.5–13 × 1.5–5 cm, obovate or narrowly so, with obtuse or rounded apex, with acute decurrent base, with pubescent prominent midrib and lateral veins on lower surface at flowering, otherwise glabrous; petiole 1.3–3.5 cm, slender, eglandular. Inflorescence an elongated spike; peduncle and rachis 6–12 cm, slender, sparsely pubescent at flowering. Flowers 4–5 mm from base of ovary to tip of calyx, yellowish green; lower hypanthium 2.5–3 mm, slender, puberulous in lower ovary-bearing part, glabrous in upper part; upper hypanthium 1.5–2 × 4–5 mm, glabrous on outside, pubescent on inside, ± entire at margin; stamens 10, exserted up to 1.5 mm; style exserted up to 1.5(–2) mm. Fruit 2–3 × 1.2–1.9 cm, ellipsoid or obovoid, subacute to rounded at apex, yellowish green when ripe, glabrous; endocarp irregularly but strongly longitudinally furrowed, slightly compressed.

The holotype is a tree 20 m × 40 cm DBH in fruit.

*Buchenavia costaricensis* is recognizable on the basis of its leaves with long thin petioles (many about half as long as the lamina); glabrous fruits with obtuse to rounded apex; glabrous upper hypanthia and mature leaves; and leaves at flowering time, inflorescence axis, and lower hypanthium only sparsely pubescent. The leaf shape, texture, and venation is also quite characteristic.

This is only the second species of *Buchenavia* to be found outside mainland South America (Exell & Stace, 1963). *Buchenavia tetraphylla* (Aublet) R. A. Howard (*B. capitata* (Vahl) Eichler) occurs in the West Indies (Cuba to Trinidad) and in Costa Rica and Panama, as well as widely throughout South America, where a further 20 species occur

(Fig. 2). *Buchenavia tetraphylla* is distinct from *B. costaricensis* in its thicker shorter petiole (0.4–1.5(–2) cm) and capitate inflorescence.

*Paratypes.* COSTA RICA. **Puntarenas:** Cantón de Osa, Playa Campanario o San Josesito, Sierpe, primary forest, 8°39′39″N, 83°42′50″W, 1–10 m, 5 Jan. 1991 (fl), *Harmon 192* (CR, LTR, MO); Cantón de Golfito Jiménez, Alto de la Carbonera, camino a Cerro de Osa, 8°25′30″N, 83°19′00″W, 200–350 m, 18 Sep. 1990 (fr), *Chacón 1046* (CR, LTR); primary forest, Parque Nac. Manuel Antonio, 9°23′N, 84°09′W, 1–10 m, 11 Apr. 1990 (fr), *Harmon 95* (CR, LTR); Cantón de Golfito La Palma, en pequeñas áreas de bosque alrededor del pueblo, 8°38′30″N, 83°23′00″W, 50 m, 14 Sep. 1992 (fr), *Aguilar 1302* (CR, LTR).

The following two specimens have been brought to my attention by Barry Hammel. COSTA RICA. **Puntarenas:** Parque Nac. Manuel Antonio, woods near ANEP road, Punta Catedral, Puerto Escondido, and Lotz Road, 9°04′N, 84°10′W, 1–100 m, 3 Jan. 1990 (in bud), *Harmon 40* (CR not seen); Cantón de Osa, Rincón de Osa, entrada a Chocuaco, 8°43′52″N, 83°27′15″W, 100–200 m, 27 Aug. 1992 (fr), *Zamora, Aguilar, Ramírez & Martín 1864* (CR not seen).

Figure 2. Distribution of *Buchenavia*. Continuous line: *B. tetraphylla*. ●: *B. costaricensis*. Broken line: 20 other species.

## *Combretum assimile* Eichler

*Combretum assimile* is a member of section *Combretum*, represented mainly by *C. fruticosum* (Loefling) Stuntz and *C. farinosum* Kunth in Central America (including Costa Rica). *Combretum assimile* differs from these two species in its larger flowers and fruits and in its dark red scales on the flowers, fruits, inflorescence axis, leaves, and young stems (golden in *C. fruticosum*, gray in *C. farinosum*). It is primarily a plant of the Amazon basin, especially on the Peru–Brazil border. *Combretum sambuense* Pittier was described from the old Panama Canal Zone, and there are also records from Colombia and Venezuela (Exell, 1953), but in my opinion that species should be included in *C. assimile*. The following collection therefore extends the known distribution of *C. assimile* westward into Costa Rica: COSTA RICA. **Puntarenas:** Reserva Forestal Golfo Dulce Aguabuena, Sector Sur, 8°42′20″N, 83°31′30″W, 50–150 m, 26 Dec. 1991, *Aguilar & Herrera 793* (LTR, MO).

*Combretum fruticosum* occurs in the same area, but the southern limit of *C. farinosum* is in northern Costa Rica.

*Acknowledgments.* I am grateful to Michael Grayum (MO) for information concerning the holotype of *Combretum graciliflorum*, to Barry Hammel (MO) for data on and specimens of *Buchenavia costaricensis*, and to Carel Jongkind (WAG) for valuable data on the African species of section *Cacoucia*.

Literature Cited

Exell, A. W. 1953. The *Combretum* species of the New World. J. Linn. Soc. (Bot.) 55: 103–141.

——— & C. A. Stace. 1963. Revision of the genera *Buchenavia* and *Ramatuella*. Bull. Brit. Mus. (Nat. Hist.), Bot. 3: 3–46.

# A New Combination in *Merremia* (Convolvulaceae) for the *Flora of China*

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ABSTRACT. On the basis of pollen morphology and floral characters, *Ipomoea caloxantha* is transferred to *Merremia*.

While revising the Convolvulaceae for the *Flora of China*, the name *Ipomoea caloxantha* Diels came to our attention. Fang & Huang (1979) listed *I. caloxantha* at the end of their treatment for *Ipomoea* with a Chinese translation of Diels's original description, but did not include it in their key to species of the genus nor give it any further discussion.

Based on Diels's description of the corolla as "intense lutea" and "flowers bright yellow," one of us (GWS) suspected this to be a *Merremia*, in which genus yellow corollas are fairly common, whereas very few *Ipomoea* species have them. The holotype of *I. caloxantha* was examined, and the suspicion proved correct. A quick check of the pollen grains under the dissecting microscope showed them to be nonspinulose, more or less spherical, and apparently 12-rugate. This conforms to Type 3 pollen described for *Merremia* in the terminology of Ferguson et al. (1977). A new combination is therefore necessary.

**Merremia caloxantha** (Diels) Staples & R. C. Fang, comb. nov. Basionym: *Ipomoea caloxantha* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 203. 1912. TYPE: China. Yunnan (western): valley of the Mekong, at the crossing of the Teng-Yueh-Talifu road, lat. 25°18′N, 4200 ft., Sep. 1903, *G. Forrest 1111* (holotype, E).

An amplified description of *Merremia caloxantha* will be published in the *Flora of China*. We maintain this species until further study can be devoted to *Merremia* in Asia, where the species are inadequately known, at best, and it is quite possible that other species remain to be described, or may have already been described under *Ipomoea*.

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Literature Cited

Fang Rhui-cheng & Huang Shu-hua. 1979. Convolvulaceae. *In:* Wu Cheng-yi (editor), Fl. Reipubl. Popularis Sin. 64(1): 1–153.

Ferguson, I. K., B. Verdcourt & M. M. Poole. 1977. Pollen morphology in the genera *Merremia* and *Operculina* (Convolvulaceae) and its taxonomic significance. Kew Bull. 31: 763–773.

# *Miconia amplinodis* (Melastomataceae: Miconieae), una Nueva Especie para Costa Rica

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RESUMEN. Se describe y se ilustra *Miconia amplinodis*, una nueva especie de Costa Rica. Su característica más sobresaliente es el poseer unas proyecciones nodales tanto en tallos como en inflorescencia. Se comenta su relacíon con otras especies del sección *Cremanium*, al cual se adscribe.

ABSTRACT. *Miconia amplinodis*, a new species from Costa Rica, is described and illustrated. The most outstanding feature of this species is its succulent auriculate projections at branch and inflorescence nodes. The relationships of *M. amplinodis* to other species in section *Cremanium* are also discussed.

*Miconia*, el género más grande de la familia Melastomataceae, se encuentra distribuido en la región neotropical con aproximadamente 1000 especies. Estas han sido agrupadas en 11 diferentes secciones en base a la gran variedad presentada en la morfología del androceo.

En Costa Rica, este género se halla representado por unas 100 especies aproximadamente; número que se ha incrementado durante los últimos años debido a una mayor actividad de colecta en bosques de mediana elevación, de donde se han descrito varias especies nuevas (Almeda & Umaña, 1993).

La especie que aquí se describe es conocida de la Cordillera de Guanacaste, Cordillera de Tilarán y la Cordillera Volcánica Central en elevaciones de 1100 a 2000 m.s.n.m.

**Miconia amplinodis** Umaña & Almeda, sp. nov.
TIPO: Costa Rica. Alajuela: Bajos del Toro Amarillo, 10°12′10″N, 84°18′43″W, 1800 m, 15 jun. 1992, *Umaña et al. 495* (holótipo, CR; isótipos, CAS, COL, F, MEXU, MO, US, USJ). Figura 1.

Frutex 0.5–2 m altus. Rami ramulique sicut petioli inflorescentiaque glabri, nodis tumidis et auriculis 2.5–3.5 mm longis infra petiolorum insertiones armatis. Petioli 1.3–4.8 cm longi; lamina 8–11.7 × 3.3–5.7 cm elliptica, apice breviter hebeti-acuminato basi acuta vel obtusa, 3-nervata. Panicula 7–17 cm longa multiflora; bracteolis 1–2 × 0.75–1 mm deciduis. Hypanthium (ad torum) 2–2.5 mm longum; calycis tubus 0.20–0.25 mm longus, lobis usque ad 0.5 mm longis et 0.75 mm latis. Petala 1.5–2 × 1–1.5 mm. Stamina 10, isomorphica glabra; filamenta 2 mm longa; antherarum thecae 1–1.4 × 0.25–0.50 mm obovato-oblongae 4-porosae, connectivo paulo (0.4 mm) prolongato. Stigma truncatum; stylus 3–3.5 × 0.2 mm glaber; ovarium ¾ inferum, 3(?)-loculare, apice truncato-conico pilis paucis glanduliferis.

Arbusto de 0.5–2 m de altura; entrenudos, ramas, pecíolos e inflorescencia glabros; nudos del tallo e inflorescencia con unas proyecciones persistentes, glabras, redondeadas y carnosas de 2.5–3.5 mm de largo; hojas de un par iguales en tamaño, elípticas, algo coriáceas, margen aserrado, 8–11.7 cm de largo y 3.3–5.7 cm de ancho, ápice corto acuminado, base anchamente aguda a obtusa; 5 nervios (incluyendo los dos nervios laterales tenues); pecíolos 1.3–4.8 cm de largo. Inflorescencia una panícula terminal de muchas flores, 7–17 cm de largo; brácteas pares, ovadas, 2–6 mm de largo y 2.5 mm de ancho, borde irregular, glabras, sésiles, caducas; bracteolas pares, ovadas, 1–2 mm de largo y 0.75–1 mm de ancho, borde irregular, glabras, sésiles, caducas; pedicelos glabros, 0.25–0.5 mm de largo; hipantio (en la floración), campanulado, glabro, con 10 costillas, 2–2.5 mm de largo hasta el toro; tubo del cáliz 0.20–0.25 mm de largo; lóbulos del cáliz glabros, anchamente redondeados, 0.5 mm de largo y 0.75 mm de ancho; dientes externos persistentes, sobrepasados en tamaño por los lóbulos del cáliz; pétalos 5, glabros, cóncavos, suborbiculares, blanco-verdosos, isomórficos, 1.5–2 mm de largo y 1–1.5 mm de ancho; filamentos glabros, distalmente geniculados, 2 mm de largo; anteras 1–1.4 mm de

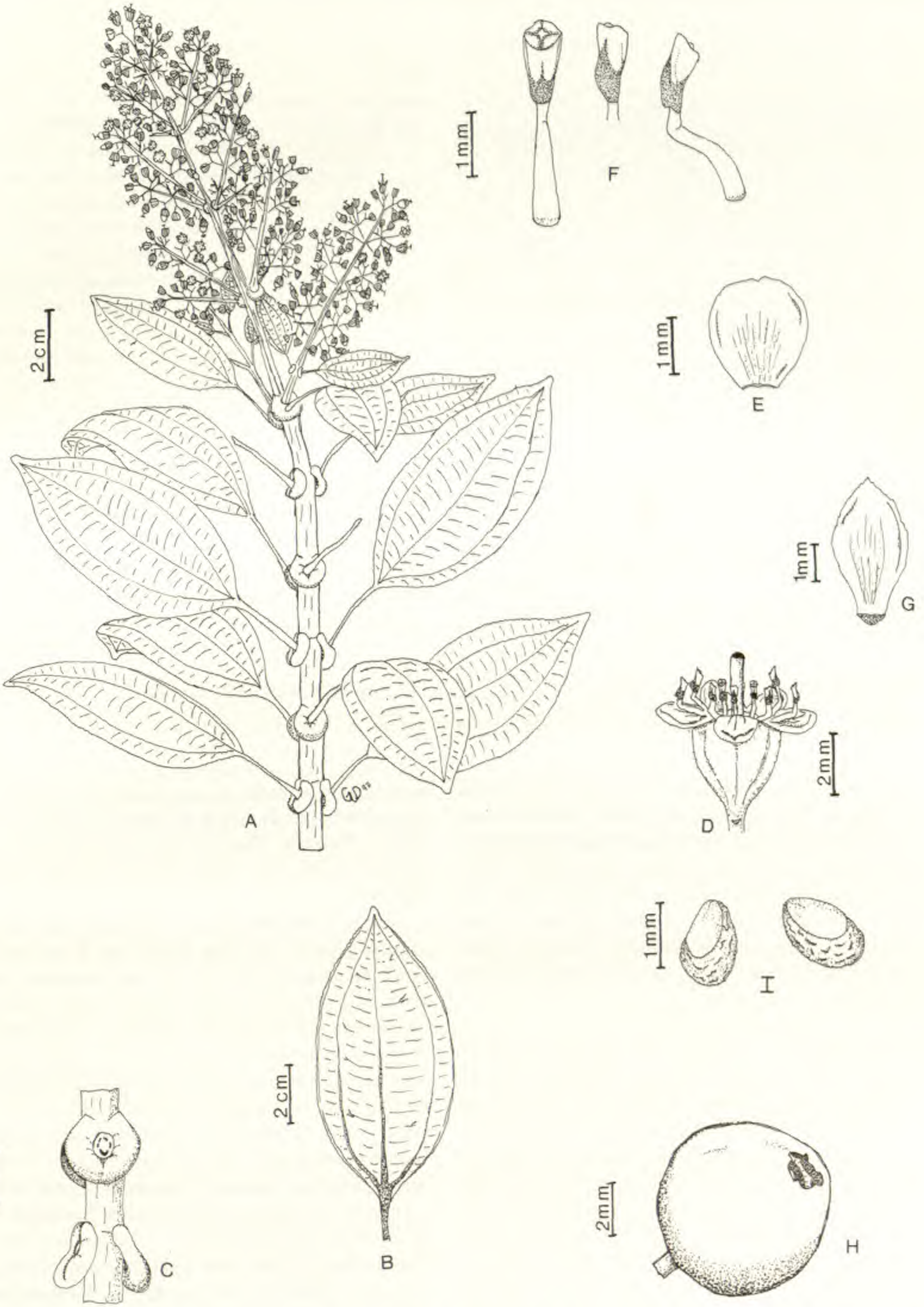


Figura 1. *Miconia amplinodis* Umaña & Almeda. —A. Hábito. —B. Superficie abaxial de la hoja. —C. Detalle de las proyecciones nodales. —D. Flor. —E. Pétalo. —F. Estambres, vista ventral (izquierda), vista dorsolateral (centro) y vista lateral (derecha). —G. Bráctea. —H. Fruto. —I. Semillas. (A–F de *Umaña et al. 495*; H, I de *Umaña et al. 465.*)

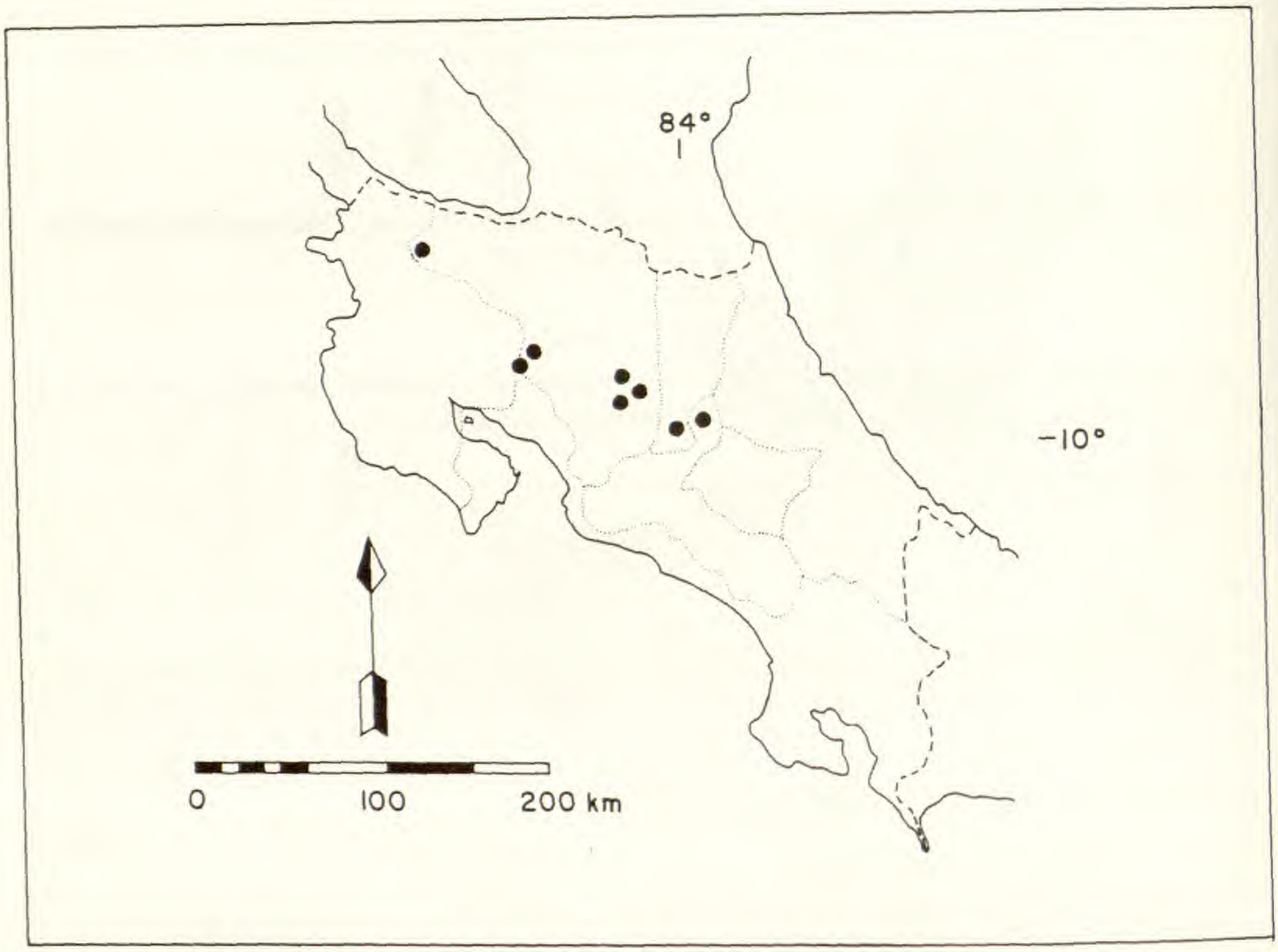


Figura 2. Distribución de *Miconia amplinodis* Umaña & Almeda en Costa Rica.

largo, cuneadas, distalmente truncadas con 4 poros terminales ventralmente inclinados; conectivo engrosado dorsalmente y prolongado bajo las tecas 0.4 mm. Ovario 3(?)-loculare, infero, estilo glabro, recto, 3–3.5 mm de largo; estigma truncado. Fruto una baya globosa, 6 mm de diámetro, morado cuando inmaduro, blanco en la madurez. Semillas numerosas, café-rojizas, ovoides, 1.3 mm de largo, la testa papilosa.

*Distribución y fenología.* Se conoce de la Cordillera de Guanacaste, Cordillera Volcánica Central (Alajuela: Bajos del Toro Amarillo, Fila Volcán Viejo cercanías del Volcán Poás; Heredia: Parque Nacional Braulio Carrillo), y de la Cordillera de Tilarán, Reserva de Bosque Nuboso Monteverde, en la parte noroeste de Costa Rica en elevaciones de 1100–2000 m. Esta especie ha sido colectada en sitios abiertos y soleados, en orillas de caminos y en potreros (Fig. 2). Los especímenes con flor han sido colectados en los meses de abril, mayo, junio, julio y septiembre; muestras con fruto en febrero, abril, septiembre, noviembre y diciembre.

*Miconia amplinodis* fue colectada por primera vez en Monteverde en 1979; esta muestra presentaba solamente frutos lo mismo que posteriores colectas hechas en la misma localidad y en Fila Volcán Viejo y Bajos del Toro. No fue hasta 1992 cuando se logró realizar una colecta de material plenamente florecido.

*Miconia amplinodis* se caracteriza por ser un arbusto glabro, con hojas glabras de 5 nervios con borde ligeramente aserrado de color morado, y con flores de 5 partes y anteras cuneiformes de 4 lóculos. Su característica más sobresaliente, y única dentro de las especies de *Miconia* conocidas para el país, es el poseer unas proyecciones persistentes, glabras, redondeadas y carnosas a nivel de nudos tanto en tallos como en inflorescencias. Estas proyecciones nodales engrosadas son raras en *Miconia* y en la familia Melastomataceae en general, y hasta el momento no se conoce su significancia funcional. Curiosamente estas estructuras presentan un color diferente dependiendo de si están expuestas o no a la luz solar; cuando es así, el color varía entre rojo y morado, cuando se hallan en sitios sombreados estas presentan un color verde. Generalmente se presentan 2 por nudo con excepción de una muestra que presentaba 3 de estas estructuras por nudo.

Esta especie, asignable a la sección *Cremanium*

en virtud de sus anteras cuneiformes de 4 lóculos, se halla relacionada cercanamente a *Miconia resima* Naudin, especie conocida solamente para Colombia. Las características que ambas comparten son el poseer flores de 5-partes y androceos muy similares. A diferencia de *Miconia amplinodis*, *M. resima* carece de las proyecciones nodales de la que parten los peciolos y las ramificaciones de las inflorescencias; posee hojas de mayor tamaño (15–20 × 6–7 cm), y presenta un estigma subpeltado.

Entre las especies de *Miconia*, dentro de la sección *Cremanium*, que poseen proyecciones anulariformes conspicuas en cada nudo, *M. amplinodis* es también similar a *M. manicata* Cogniaux & Gleason de Colombia, en el tamaño de las hojas, morfología del hipantio, y forma de los pétalos. *Miconia manicata* difiere de nuestra nueva especie en poseer lámina foliar ciliada (los cilios de approx. 1 mm de largo) y base largo cuneada, tecas de las anteras de 4 poros incompletos con el conectivo basalmente trilobulado, ovario medio infero, y estigma capitado.

El nombre dado a esta especie hace alusión a las proyecciones conspicuas que presente a nivel de nudos en tallos e inflorescencias, características que la hace fácil de reconocer.

*Parátipos.* COSTA RICA. **Alajuela:** Volcán Poás, faldas del Cerro innominado ubicado al N del cráter, 5 mayo 1992, *Ballestero 148* (CR); San Carlos, Fila Volcán Viejo, 1800–2000 m, 11–14 feb. 1986, *Gómez-Laurito 11021* (CR); San Carlos, Fila Volcán Viejo, 1800–2000 m, 13 nov. 1986, *Gómez-Laurito 11251* (CR); Bajos del Toro Amarillo, 10°12′10″N, 84°18′43″W, 1800 m, 10 abr. 1989, *Umaña et al. 276* (CR), 28 abr. 1992, *Umaña et al. 465* (CR), 14 mayo 1992, *Umaña et al. 484 y 488* (CR). **Alajuela/Puntarenas/Guanacaste:** Cordillera de Tilarán, Reserva Biológica Monteverde, 1540–1600 m, 21 feb. 1986, *Almeda et al. 4999* (CAS, CR); Reserva Biológica Monteverde, 10°18′N, 84°46′W, 1100 m, 1 jul. 1989, *Bello 996* (CAS, CR); Reserva Biológica Monteverde, 1500–1600 m, *Haber ex Bello 5190* (CAS, CR, MO); Reserva Biológica Monteverde, 10°18′N, 84°47′W, 1500–1600 m, 16 jul. 1990, *Haber & Zuchowski 10014* (CAS, CR, MO); Reserva Biológica Monteverde, 10°18′N, 84°47″W, 1500–1600 m, 31 dic. 1990, *Haber & Zuchowski 10378* (CAS, CR, MO); Reserva Biológica Monteverde, 10°18′N, 84°47′W, 1520–1600 m, 14 sep. 1991, *Haber & Zuchowski 10872* (CAS, CR, MO); Reserva Biológica Monteverde, 10°18′N, 84°48′W, 1600 m, 17 jun. 1992, *Haber et al. 11206* (CR); Reserva Biológica Monteverde, 3 jul. 1979, *Lumer 1086* (CAS). **Heredia:** Parque Nacional Braulio Carrillo, San Isidro, Cerro Zurquí, 10°03′30″N, 84°01′15″W, 1800 m, 16 jul. 1992, *Ballestero et al. 177* (CR). **Guanacaste:** Parque Nacional Rincón de la Vieja, Sector Las Pailas en la cima del Volcán, 10°49′30″N, 85°19′30″W, 1700 m, 9 enero 1994, *Morales 2243* (CR).

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Literatura Citada

Almeda, F. & G. Umaña D. 1993. New species of *Miconia* (Melastomataceae) from Costa Rica. Novon 3: 5–10.

# *Justicia nevlingii* (Acanthaceae), a New Species from Mexico

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ABSTRACT. A new species of *Justicia* with heteromorphic bracts, *J. nevlingii*, is described from southern Mexico. The species is compared to two other heteromorphically bracted species from Mexico and Central America, *J. chol* and *J. costaricana*. It differs from these in several features, including its 4-aperturate pollen.

In 1974, Larry Nevling of the Field Museum of Natural History called to the attention of the senior author an unusual collection of Acanthaceae from Veracruz representing an unknown species. Other collections resembling this species from Veracruz and Chiapas have since been assembled and studied. They are described below as a new species of *Justicia* with heteromorphic bracts.

**Justicia nevlingii** Wasshausen & T. F. Daniel, sp. nov. TYPE: Mexico. Veracruz: Hidalgotitlán, 0–2 km del Plan de Arroyo–Alvaro Obregón, 17°01'N, 94°40'W, 14 Apr. 1974, *J. Dorantes et al. D-2799* (holotype, US; isotype, F). Figures 1, 2.

Herba perennis usque ad 1.5 m alta. Folia petiolata, laminae ovatae, 6.5–18.5 cm longae, 3–10.4 cm latae. Spicae terminales et axillares, densae, pedunculis et rhachidibus dense pilosis. Bracteae heteromorphae; bracteae fertiles petiolatae, obovatae vel ellipticae, 5.5–12 mm longae, 2.7–6.5 mm latae; bracteae steriles lineares-lanceolatae vel lineares vel subulatae, 2–5 mm longae, 0.3–0.5 mm latae. Calyx 5-lobus. Corolla alba vel flavida vel cremea, 9–10 mm longa, extus pubescens trichomatibus eglandulosis. Thecae antherarum 2, superpositae, glabrae, theca inferiore basi calcarata; pollen 4-apertum. Capsula 7–8.5 mm longa, pilosa. Semina 2.

Erect, perennial herbs to 1.5 m tall. Stems subquadrangular, quadrifariously pilose with trichomes eglandular, appressed and spreading, 0.7–2 mm long, multi-septate with maroon septae. Leaves petiolate, petioles 1.5–7.2 cm long, densely pilose, blades ovate to elliptic, 6.5–18.5 cm long, 3–10.4 cm wide, short-acuminate at apex, obtuse or rounded to subattenuate at base, entire to sinuate, upper surface glossy, sparingly pilose with trichomes appressed, lower surface more densely pilose (especially the central and lateral veins) with trichomes appressed and spreading, to 1 mm long. Inflorescence of (axillary and) terminal dense panicles of spikes to 15 cm long and 1.5–4.4 cm diam., erect or ascending, rachises densely pilose with trichomes sordid, erect, to 1 mm long. Floral bracts heteromorphic; fertile bracts petiolate, obovate to elliptic, 5.5–12 mm long, 2.7–6.5 mm wide, acute to truncate-apiculate at apex, abaxial surface pubescent with antrorse-appressed eglandular trichomes 0.1–0.5 mm long and glandular trichomes to 0.2 mm long, margin ciliate with cauline type trichomes; sterile bracts linear-lanceolate to linear to subulate, 2–5 mm long, 0.3–0.5 mm wide. Bracteoles oblanceolate, 4–9 mm long, 1.2–2.2 mm wide. Calyx deeply 5-lobed, 3–5 mm long, lobes lanceolate, 2.5–4 mm long, 0.5–0.6 mm wide, puberulous. Corolla white to yellowish to cream, 9–10 mm long, externally pubescent with eglandular trichomes 0.2–0.5 mm long; tube 5–5.5 mm long, 0.8 mm diam. at base, 3 mm diam. at apex; limb 2-lipped, upper lip erect, rugulate, ovate-lanceolate, 3–4.5 mm long, 2 mm wide, 2-lobed at apex, lobes ca. 0.25 mm long and wide, rounded, lower lip ± spreading, 3-lobed, 3.5–6 mm long, 3 mm wide at base of lobes, lobes obovate, 1.2–1.5 mm long, 1.2–1.5 mm wide, rounded at apex. Stamens inserted near apex of corolla tube, 4 mm long, filaments glabrous, thecae superposed, glabrous, upper theca ca. 1 mm long, lower thecae ca. 0.8 mm long, calcarate with blunt appendage ca. 0.3 mm long; pollen prolate 4-aperturate, apertures flanked on each side by a ± continuous band of exine and a pseudocolpus (Fig. 2); 2 staminode-like protrusions of corolla present near base of filaments, 0.4–1.2 mm long, densely villous. Style 6.5–7 mm long, glabrous, stigma 0.2–0.3 mm long. Capsules 7–8.5 mm long, pilose. Seeds 2,

Figure 1. *Justicia nevlingii* Wasshausen & T. F. Daniel (*Dorantes et al. D-2799*). —A. Habit. —B. Bract. —C. Bracteoles. —D. Calyx lobes. —E. Corolla and stamens. —F. Expanded corolla, stamens, and staminode-like protrusions.

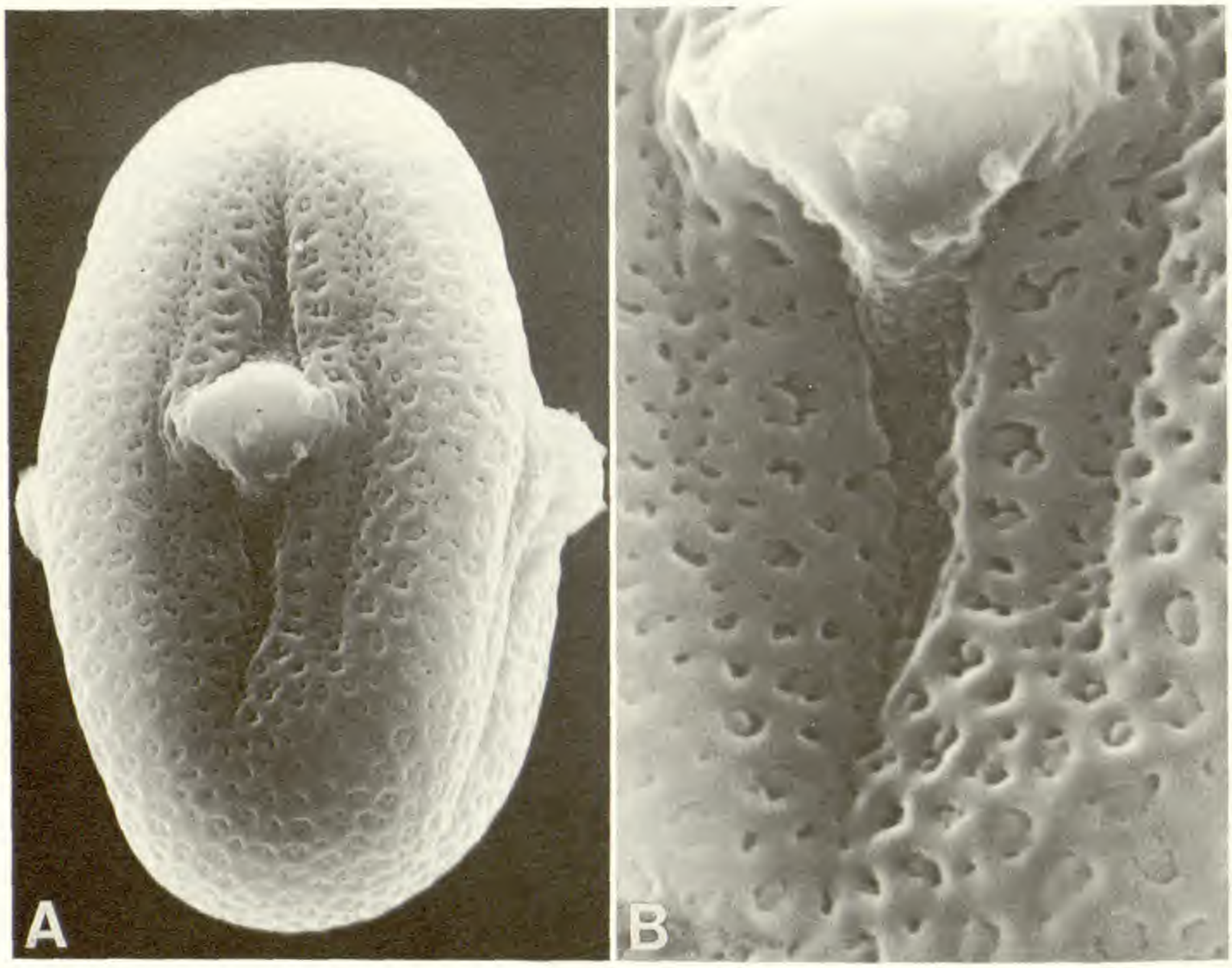


Figure 2. Scanning electron (SEM) photomicrographs of pollen of *Justicia nevlingii* (*Dorantes et al. D-2799*). —A. Equatorial view, ×2800. —B. Portion of aperture, ×7000.

spherical to discoid, flattened, 2.1–2.8 mm long, 2–2.5 mm wide, smooth.

*Distribution.* Southern Mexico (Chiapas and Veracruz); plants occur in lowland and lower montane rainforests at elevations from 130 to 470 m.

*Paratypes.* MEXICO. **Veracruz:** Mpio. Hidalgotitlán, 0–2 km road Plan de Arroyo–Arroyo Alegre, 17°15′N, 94°35′W, 23 Apr. 1974, *Jésus Dorantes et al. D-2964* (F, US); Mpio. Hidalgotitlán, between Hnos. Cedillo-Augustín Melgar, 17°13′30″N, 94°35′W, 26 Apr. 1974, *Mario Vázquez et al. 411* (F, US); Las Choapas, Las Cruces, 14 July 1970, *A. Gómez-Pompa & L. Nevling 1522* (F, MEXU); Mpio. Hidalgotitlán, La Laguna, Uxpanapa, 29 Mar. 1974, *A. Gómez-Pompa & L. Nevling 5183* (F). **Chiapas:** Mpio. Ixtacomitán, above Ixtacomitán, 10 May 1973, *D. Breedlove 35058* (DS, MEXU); St. Bartolo, Apr. 1840, *J. Linden s.n.* (G, P); along Río Pichucalco, 3 km NE of Pichucalco toward Villahermosa, 17°32′N, 93°04′W, 2 July 1969, *B. Marcks & C. Marcks 913* (LL, WIS); 37 km NW of Bonampak, 6 km NNW of Nuevo Guerrero, *G. Davidse et al. 20534* (BM, LL, MEXU); between Pichucalco and Rayón near Solosuchiapa, cuadrante 57-A, *J. Chavelas P. et al. 442* (MEXU).

*Justicia nevlingii* resembles both *J. chol* T. F. Daniel (Chiapas) and *J. costaricana* Leonard (Costa Rica) by its heteromorphic bracts and staminode-like protrusions of the corolla. It may be distinguished from these species by the following key:

1a. Bracts eciliate or inconspicuously ciliate with trichomes to 0.2 mm long; calyx 5–7 mm long; corolla externally glandular; cauline trichomes lacking maroon septae; cloud forests at 900–1550 m in Costa Rica ..... *J. costaricana*

1b. Bracts conspicuously ciliate with trichomes to 2 mm long; calyx 2.5–5 mm long; corolla externally eglandular; cauline trichomes with conspicuous maroon septae; lowland to lower montane rainforests at 50–470 m in Mexico.

2a. Young stems with trichomes concentrated in 2 lines; inflorescence of axillary spikes; bracteoles 0.4–1 mm wide; style pubescent; seeds 4, 1.3–1.6 mm long, covered with low rounded papillae or ridges; pollen 3-aperturate ..... *J. chol*

2b. Young stems with trichomes restricted to 4 lines; inflorescence of (axillary to) terminal panicles of spikes; bracteoles 1.2–2.2 mm wide; style glabrous; seeds 2, 2.1–2.8 mm long, smooth; pollen 4-aperturate ..... *J. nevlingii*

Graham (1988) stated that the pollen of *Justicia* is either 2- or 3-aperturate but that 4-aperturate pollen (not confirmed by her study) had been reported in a few New World species. Daniel (1990,

1993) documented 4-aperturate pollen in several species of *Justicia* (i.e., *J. angustiflora* D. N. Gibson, *J. tabascina* T. F. Daniel, and *J. valvata* T. F. Daniel) and has since observed it in several others (e.g., *J. multicaulis* Donnell Smith, *J. silvicola* D. N. Gibson, and *J. warnockii* B. L. Turner).

Graham (1988) also noted that all the species of *Justicia* that she had observed have an androecium of two stamens and no staminodes. *Justicia nevlingii* and the two other heteromorphically bracted species of *Justicia* noted above exhibit two staminode-like protrusions near the base of the filaments. It is not known whether these protrusions technically are staminodes or whether they are merely thickenings of the corolla near the point of insertion of the filaments. Whatever their origin, they appear to be present in species of *Justicia* with heteromorphic bracts. Heteromorphically bracted species of *Justicia* are now known from Mexico and Central America, and they undoubtedly occur in South America as well. Determining whether they constitute a monophyletic infrageneric taxon within *Justicia* deserves additional study.

*Acknowledgments.* We thank Alice Tangerini for skillfully preparing the line drawings, and Stephen F. Smith and the staff of the National Museum of Natural History SEM Laboratory for providing the high-quality pollen photomicrographs.

Literature Cited

Daniel, T. F. 1990. New and reconsidered Mexican Acanthaceae. IV. Proc. Calif. Acad. Sci. 46: 279–287.

———. 1993. New and reconsidered Mexican Acanthaceae. V. Contr. Univ. Michigan Herb. 19: 271–291.

Graham, V. A. 1988. Delimitation and infra-generic classification of *Justicia* (Acanthaceae). Kew Bull. 43: 551–624.

# Errata

Croat, T. B. & M. H. Grayum. 1994. *Philodendron* Subgenus *Pteromischum* (Araceae) from Saül, French Guiana. Novon 4: 211–219.

On page 216, second column, third paragraph, in the discussion of *Pteromischum placidum*, the following should be changed: "It [*Pteromischum placidum*] is very easily confused with *P. rudgeanum* Schott, which differs in climbing directly up the side of the tree, and in having blades that are matte rather than glossy on the lower blade surfaces, a slender spadix, and in generally flowering ahead of *P. placidum*. It was rarely at anthesis during mid-February, whereas many plants of *P. placidum* were in flower." It should read: "It [*Pteromischum placidum*] is very easily confused with *P. rudgeanum* Schott . . . and in generally flowering later than *P. placidum*. *Philodendron placidum* was rarely in flower in mid-February, whereas many plants of *P. rudgeanum* were in flower."

On page 219, the first paragraph of the second column, the following should be changed: "In addition, *Philodendron placidum* flowers later than *P. rudgeanum*, which was only rarely in flower in mid-February when *P. placidum* was in full flower." It should read: "In addition, *P. rudgeanum* flowers later than *P. placidum*, which was only rarely in flower in mid-February when *P. rudgeanum* was in full flower."

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# A Note on the Kazakh Endemic *Lappula zaissanica* (Boraginaceae)

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ABSTRACT. Studies of the Kazakh endemic *Lappula coronifera* (M. Popov) subsp. *zaissanica* Aralbaev show that it is a distinct species. The new combination *Lappula zaissanica* (Aralbaev) Aralbaev is proposed.

Recent collections of an interesting *Lappula* from the Zaissan depression of eastern Kazakhstan were referred to *Lappula coronifera* by Kudabaeva & Aralbaev (1989). Subsequent collections showed that the plants represent a distinct subspecies, *L. coronifera* subsp. *zaissanica* (Aralbaev, 1990). Further studies and critical comparison with authentic plants of *L. coronifera*, as well as additional fieldwork, revealed that the plants in question represent a distinct species quite common in the Zaissan depression. A new combination is herein proposed.

**Lappula zaissanica** (Aralbaev) Aralbaev, comb. nov. Basionym: *Lappula coronifera* M. Popov subsp. *zaissanica* Aralbaev, Bot. Zhurn. 75: 707. 1990. TYPE: E Kazakhstan. Northern Zaissan: above Schubarschilik, sandy-pebbled desert, 8 June 1984, *Aralbaev s.n.* (holotype, Altay Botanical Garden, Leninogorsk (AIC); isotype, LE).

Herbs annual, 7–15(–20) cm tall. Stems 1 or several, branching at base or apex. Basal leaves rosulate, dried at fruiting time; cauline leaves sessile, lanceolate, 9–12 mm long, 1–2.5 mm wide, somewhat longitudinally folded, sparsely tomentose and greenish adaxially, moderately tomentose abaxially. Bracts shorter than fruits, lowermost oblanceolate, upper ones narrowly lanceolate. Pedicels tomentose, as long as or slightly longer than calyx, slightly reflexed in fruit. Calyx tomentose, with bristly tubercles; lobes in fruit narrowly lanceolate, 3.5–4 mm long, slightly reflexed. Corolla blue, 3 cm long, with broadly campanulate limb. Fruit broadly ovoid; nutlets similar, with a smooth crownlike cup turning from yellow to brown as nutlets mature, each side with 6 long, glochidiate spines shorter than or nearly as long as the cup; disc not keeled, smooth, bright; gynophore 2–2.5 mm long; style exserted from nutlets by 0.2–0.3 mm.

*Lappula zaissanica*, which is a Kazakh endemic known thus far only from the Zaissan depression, is most closely related to *L. coronifera*, from which it differs by having nutlets with smooth, not keeled, bright-colored discs and broader wings with shorter teeth.

*Additional specimens examined.* KAZAKHSTAN. **N Zaissan Region:** in valleys above Kiin-Kerish, 18 May 1983, *Aralbaev s.n.* (paratype; AIC); Kara-Biryuk, pebbled desert, 12 June 1993, *Aralbaev s.n.* (Main Botanical Garden, Almaty).

*Acknowledgments.* I am grateful to Ihsan Al-Shehbaz and Larissa A. Karavaeva for their help with the manuscript.

Literature Cited

Aralbaev, N. K. 1990. A note on *Lappula coronifera* (Boraginaceae). Bot. Zhurn. (Moscow & Leningrad) 75: 707–708.

Kudabaeva, G. M. & N. K. Aralbaev. 1989. Genus *Lappula* Moench. in flora of north part of Zaissan's depression. Mat. Kazakh. Acad. Bot. Inst. Herb. Alma-Ata 1989: 34–42.

# New Species of *Gibsoniothamnus* (Bignoniaceae: Schlegelieae)

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ABSTRACT. Three new species of *Gibsoniothamnus* L. O. Williams, *G. grandiflorus*, *G. stellatus*, and *G. versicolor*, are described as new.

*Gibsoniothamnus* L. O. Williams is a genus of about 14 species of epiphytic shrubs, variously classified in the Bignoniaceae or Scrophulariaceae. This unusual group of Central American epiphytes is most closely related to the neotropical genus *Schlegelia* Miquel, currently classified in the Bignoniaceae tribe Schlegelieae. Undescribed species have been filed with both Scrophulariaceae and Bignoniaceae, so a collaborative project was begun to identify and describe the new species. Collaborative work was cut short by the untimely death of Al Gentry. The following species were discovered during the study.

**Gibsoniothamnus grandiflorus** A. Gentry & Barringer, sp. nov. TYPE: Panama. Veraguas: ridge of Cordillera de Tute along trail to Cerro Tute, ca. 3–4 km past Escuela Agrícola Alto de Piedra, just W of Santa Fe, 8°32′N, 81°07′W, 20 Mar. 1982, *Knapp & Kress 4389* (holotype, MO; isotype, PMA). Figure 1.

Species floribus grandis, a *Gibsoniothamno truncato* lobis calyce triangulatis longe acuminatis, pedicellis longioribus differt.

Epiphytic shrub to 3 m tall; bark gray-brown; stems angled, glabrous, to 5 mm diam., with raised leaf bases at the nodes. Leaves opposite, subequal to equal across the node; petioles 5–14 mm long, glabrous or sparsely pubescent; blade ovate to obovate or lanceolate, 6.5–14.5 cm long, 3.0–6.2 cm wide, coriaceous, glabrous, shiny above, the base cuneate, the apex acuminate, secondary veins 3 or 4 per side, impressed above, prominent below, glandular pits in fields between the veins below, pocket domatia occasionally present in the axils of the midvein and secondary veins toward the base of the blade. Flowers in congested, axillary panicles; primary peduncle to 1.5 cm long; bracts narrowly triangulate, 3–5 mm long, pubescent; the secondary peduncles to 7 mm long; bracteoles to 3 mm long, ovate, acuminate; pedicels 2.5–3.5 cm long, thicker above; calyx funnelform, the tube 5–9 mm long, red to red-purple, the lobes narrowly triangulate, unequal, 7–13 mm long, long-acuminate, glabrous to minutely ciliate; corolla cylindric, slightly ampliate above, 3.5–4.0 cm long, 6–7 mm diam., reddish pink to red, fleshy, the upper lobes rounded, 3–4 mm long and wide, the lateral lobes rounded to ligulate, 4–5 mm long, 4 mm wide, the median lobe ligulate, 4–6 mm long, 3–4 mm wide; stamens attached 6–9 mm from the base of the corolla tube, filaments 20–26 mm long, glabrous; staminode 10–20 mm long, filiform, the apex clavate; pistil glabrous, the ovary globose to oblate, 2–3 mm diam., the style 30 mm long, the stigma slightly bilobed. Berry globose, 8–10 mm diam., green.

This species is most easily distinguished by its large, slightly ampliate flowers. It appears to be most closely related to *Gibsoniothamnus truncatus* and *G. latidentatus*. It differs from *G. truncatus* by its larger, ampliate corollas, pedicels more than 2 cm long, and narrowly triangulate calyx lobes. It differs from *G. latidentatus* by its corollas more than 3 cm long, reddish calyx, short staminode, and calyx lobes 7–13 mm long. This species has an interesting disjunct distribution: the plants from Panamá, collected along the El Llano–Cartí road, have narrower, more acuminate leaves than those from Coclé, mostly collected on Cerro Tute.

*Paratypes.* PANAMA. **Coclé**: vicinity of Escuela Agrícola Alto de Piedra, 3200–3400 ft., 3 Apr. 1980, *Antonio 3961* (MO); about 16 km NW of Santa Fe on descent to Río Caloveborita, 650 m, 4 Sep. 1975, *Dressler 5142* (MO); near third branch of Río Santa María, 10–14 km NW of Santa Fe, 650–750 m, 10–11 Oct. 1975, *Dressler 5171* (MO); shoulder of Cerro Tute, 25 May 1977, *Folsom & Edwards 3345* (MO); ridge of Cerro Tute, along trail to Cerro Tute, 3–4 km past Escuela Agrícola Alto de Piedra, 8°32′N, 81°07′W, 800–1400 m, 20 Mar. 1982, *Knapp & Kress 4363* (MO); Cerro Tute, E slopes, 1 km beyond Escuela Agrícola Alto Piedra

Figure 1. *Gibsoniothamnus grandiflorus* A. Gentry & Barringer. —Habit (*Knapp & Kress 4360*, MO). Scale bar = 2 cm.

above Santa Fe, 900–1200 m, 14 May 1981, *Sytsma & Andersson 4655* (MO, PMA). **Panamá**: El Llano–Cartí road, 10 km N of Pan Am Highway, 340 m, 15 Feb. 1975, *Gentry & Mori 14216* (F, MO); 6–7 mi. from PanAmerican highway on El Llano–Cartí road, 9°12′N, 79°00′W, 400 m, 26 Feb. 1982, *Knapp & Mallet 3829* (MO, PMA); 8.2 mi. from Panamerican highway on the El Llano–Cartí rd., 9°14′N, 79°00′W, 450 m, 24 Mar. 1982, *Knapp & Hufi 4415* (MO, PMA); road between El Llano and Cartí–Tupile road, 12 mi. above Pan American highway, 200–500 m, 30 Mar. 1973, *Liesner 1321* (F, MO, NY, PMA); El Llano–Cartí rd., 10.8 km from interamerican highway, 1100–1200 ft., 27 Dec. 1974, *Mori, Kallunki & Hansen 4121* (MO); El Llano–Cartí road, 21.6 mi. from Inter-American highway, 350 m, 20 Mar. 1975, *Mori & Kallunki 5104* (MO, PMA); El Llano–Cartí road, 9 mi. from Pan American highway, 350–400 m, 28 Apr. 1981, *Sytsma 4146* (NY).

**Gibsoniothamnus stellatus** A. Gentry & Barringer, sp. nov. TYPE: Panama. Chiriquí: Cerro Colorado, along road to copper mine 33.1 km beyond the bridge over the Río San Felix, 13.1 km beyond turnoff to Escopeta, 1400 m, 15 July 1976, *Croat 37200* (holotype, MO; isotype, MO). Figure 2.

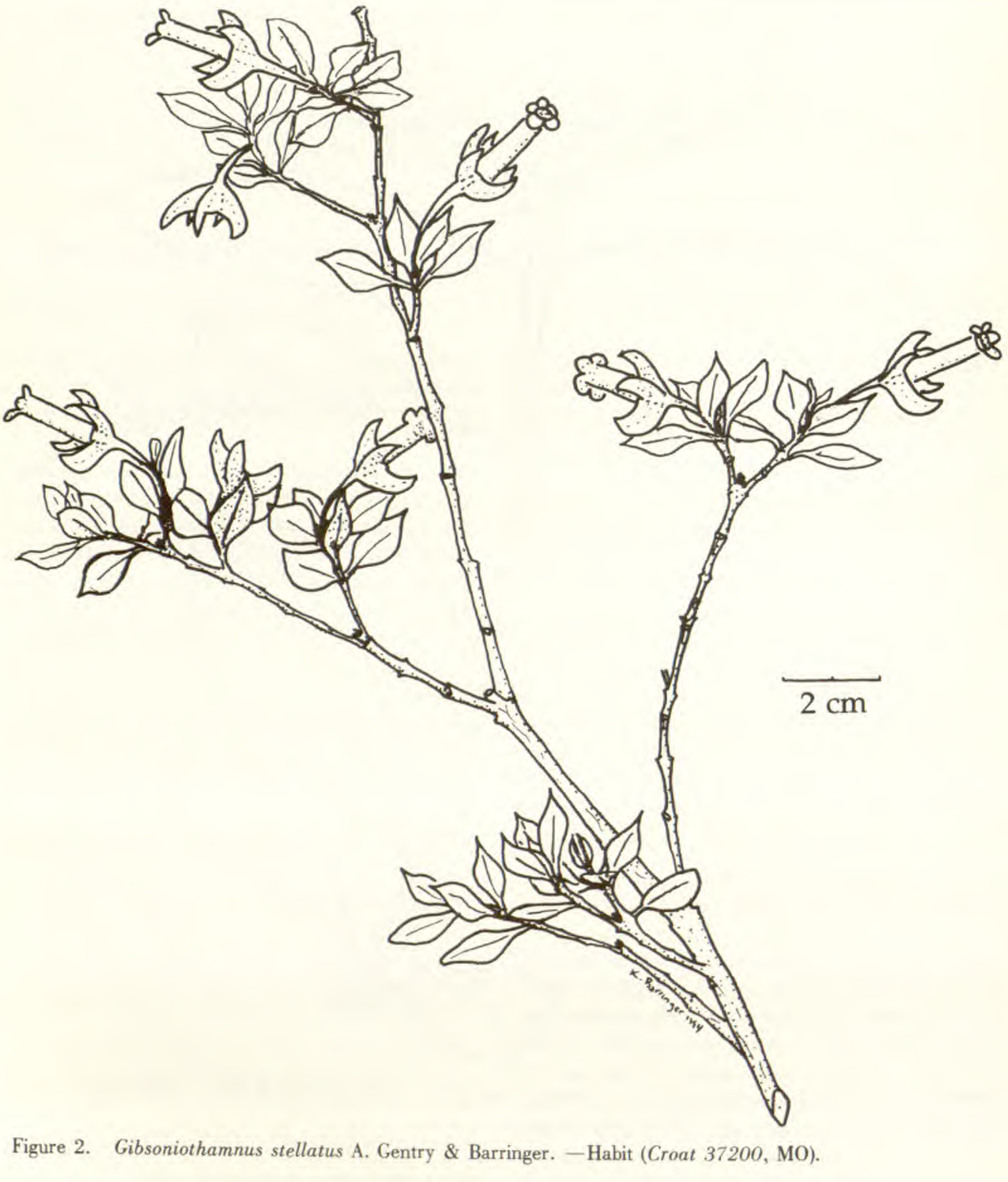


Figure 2. *Gibsoniothamnus stellatus* A. Gentry & Barringer. —Habit (*Croat 37200*, MO).

A *Gibsoniothamno alato* foliis minoribus, petiolis 3–5 mm longis, tubis calyce 6–8 mm longis, staminibus 17–18 mm longis differt.

Epiphytic shrub to 1.5 m tall; bark pale gray-brown; stems angled, glabrous, the leafy portions to 2 mm diam., the older portions with raised leaf bases. Leaves opposite, unequal to subequal; petioles 3–5 mm long, glabrous, unwinged; lamina ovate-lanceolate, coriaceous, glabrous, gland-dotted, the base cuneate, the apex acuminate to acute, the midvein impressed above, prominent below, the secondary veins not impressed above, prominent below, 2–3 per side, domatia occasionally found on the underside of the lamina near the base, the larger leaves 15–25 mm long, 9–16 mm wide, the smaller leaves 5–12 mm long, 4–8 mm wide. Flowers borne near the tips of the branches, solitary, axillary; pedicels 10–12 mm long, thick above, bracteolate at base, glabrous; calyx campanulate, purple, the tube 6–8 mm long, the lobes 8–9 mm long, triangulate, the wings broad, 3–4 mm wide; corolla tubular, white,

Figure 3. *Gibsoniothamnus versicolor* A. Gentry & Barringer. —Habit (*Herrera et al. 1022*, BKL).

2.0–2.5 cm long, 4–5 mm diam., the upper and lateral lobes rounded to ligulate, 3–4 mm long and wide, the margin ciliate, the median lobe ligulate, 3 mm long, 1.5–2.0 mm wide; stamens attached 5 mm above the base of the corolla tube, with a ring of trichomes at the point of insertion, the filaments 17–18 mm long; staminode 5–6 mm long; pistil glabrous, the ovary globose, 1.5 mm diam., the style 14 mm long, the stigma capitate. Immature berries globose, green.

This species is distinguished by its small leaves and large, winged calyx lobes. It appears to be most closely related to *Gibsoniothamnus alatus*, native

to southern Darién and adjacent Chocó, because both species have strongly alate calyces and white corollas. It can be distinguished from that species by its smaller leaves, calyx tube more than 5 mm long, and stamens less than 18 mm long.

*Paratypes.* PANAMA. **Bocas del Toro:** region of Cerro Colorado, 7.5 mi. from Chami camp, 8°35′N, 81°45′W, 1220–1250 m, 13 Apr. 1986, *McPherson 8882* (MO, NY, PMA).

**Gibsoniothamnus versicolor** A. Gentry & Barringer, sp. nov. TYPE: Panama. San Blas: Playon Chico, Río Ukupseni, Campamento Neba Dummat hasta las cascada, 50–100 m, 9°15′N, 78°15′W, 30 Oct. 1991, *H. Herrera, J. Morris & J. Mojica 1022* (holotype, MO; isotypes, BKL, PMA). Figure 3.

A *Gibsoniothamno allenii* foliis majoribus anguste ellipticis, petiolis ciliatis, floribus paniculatis, lobis calyce majoribus differt.

Epiphytic shrub or climber; bark gray-brown; stems angled, glabrous to sparsely pilose, with raised leaf bases at the nodes. Leaves opposite, equal to subequal; petioles 5–12 mm long, pilose, unwinged; blade narrowly elliptic, 4–11 cm long, 1.7–4.0 cm wide, subcoriaceous, dull olive gray above, tannish below, sparsely pilose above, with scattered trichomes along the midvein below, strongly lepidote-glandular below, domatia absent. Flowers in terminal panicles; pedicel 2–3 cm long, sparsely pilose, slightly thickened above; calyx campanulate, pink to mauve, the tube 3–5 mm long, the lobes nearly linear, 7–12 (–15 in fruit) mm long, porrect, then reflexed after anthesis; corolla tubular, white or reddish violet, 2 cm long, 4 mm wide at the base, 3 mm wide near the apex, the lobes ovate to round, 1.5–3.0 mm long; stamens inserted 4–5 mm from the base of the corolla tube, with a basal ring of trichomes, the filaments 1 cm long; staminode 5 mm long, filiform; ovary depressed-globose, 2 mm long, glabrous, the style 15 mm long, the stigma subcapitate. Young fruit green, subglobose, 6 mm long.

This species differs from *Gibsoniothamnus alatus* A. Gentry, the only other species in this genus known from eastern Panama, by its linear, unwinged calyx lobes. It appears to be most closely related to *G. allenii* A. Gentry, which grows in the hills around El Valle. This species differs from *G. allenii* by its longer calyx lobes, 7–15 mm long, and its larger, subcoriaceous leaves. D'Arcy (1979) listed *Croat 27281* under *G. cornutus* (Donnell Smith) A. Gentry, but that species differs by its short, triangulate calyx lobes and coriaceous leaves.

*Paratype.* PANAMA. **Darién**: headwaters of the Río Tuquesa, gold mining camp of Tyler Kitteridge, ca. 2 air km from the continental divide, 26 Aug. 1974, *Croat 27281* (MO).

*Acknowledgments.* I thank the curators of F, MO, NY, and US for allowing us to study their collections.

Literature Cited

D'Arcy, W. G. 1979. Scrophulariaceae. *In:* R. E. Woodson & Shery, Flora of Panama. Ann. Missouri Bot. Gard. 77: 173–274. [*Gibsoniothamnus* pp. 220–227.]

# Two New Species of *Weinmannia* (Cunoniaceae) from the Venezuelan Guayana

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ABSTRACT. Two new species of *Weinmannia* (Cunoniaceae) from the highlands of southern Venezuela are described and illustrated. *Weinmannia ilutepuiensis* P. E. Berry & J. Bradford is a simple-leaved, serrate-margined species known only from Ilú-tepui in Estado Bolívar, and *Weinmannia corocoroensis* J. Bradford & P. E. Berry is a pinnate-leaved species with tiny, revolute-margined leaflets currently known only from Cerro Coro Coro in Estado Amazonas.

While preparing the floristic treatment of Cunoniaceae for the *Flora of the Venezuelan Guayana* and as part of a broader study of neotropical *Weinmannia* by the second author, two distinctive new species of *Weinmannia* were found among the collections examined from the tepuis, or tabletop mountains, of southern Venezuela. Both species were collected from relatively poorly explored mountains, one from Ilú-tepui in Estado Bolívar, and the other from Cerro Coro Coro in Estado Amazonas. These species are described and illustrated below.

**Weinmannia ilutepuiensis** P. E. Berry & J. Bradford, sp. nov. TYPE: Venezuela. Estado Bolívar: Ilú-tepui, lower plateau, with varied habitats, rocky, boggy, and short forest to 5 m tall, 05°25′03″N, 60°29′W, 2500 m, 16 Apr. 1988, *Liesner 23413* (holotype, MO; isotypes, NY, US, VEN). Figure 1A–D.

Frutex vel arbor 1–5(–10)-metralis, foliis simplicibus, laminis foliorum infra dense ochraceo-lanatis, ellipticis, coriaceis, marginibus serratis, 1.5–6.0 × 0.8–3.5 cm; pseudoracemis 4–6 cm longis, lanatis, pedicellis sub anthesi 1–2.5 mm longis post anthesin 2.5–4 mm longis; capsulis villoso-lanatis, 3–3.5 mm longis.

Shrub or small tree 1–5(–10) m tall; young stems lanate, nodes hirsute. Leaves opposite, simple, elliptical, subcoriaceous, 1.5–6.0 cm long, 0.8–3.5 cm wide, broadly acute to rounded at the apex, broadly acute at the base, sparsely pilose to glabrescent and dark green on the upper surface, light brown and densely lanate-villous on the lower surface; secondary veins 10–15 per side, impressed on the upper surface and prominent on lower surface, subparallel from midvein until divaricating within ca. 4 mm of the margin with each branch joining an adjacent branch at a marginal sinus; margins serrate, planar to revolute, with 10–15 glandular teeth per side between successive sinuses or adjacent to a sinus; petioles 3–4 mm long, lanate; stipules broadly elliptical to suborbicular, 3–6 mm long, 3–5 mm wide, hirsute on the outside, dark brown and glabrous adaxially. Pseudoracemes in pairs at the branch apex, exceeding the leaves, 4–6 cm long, axis lanate. Flowers arranged in fascicles along the inflorescence axis with 1–several flowers per fascicle; bracteoles subtending fascicles, linear to obovate, 1.5–2 mm long, with long hairs on the dorsal surface; pedicels 1.0–2.5 mm long in flower, 2.5–4.0 mm long in fruit, lanate; sepals four, elliptic to narrowly deltoid, acute, 1–1.5 mm long, lanate abaxially, glabrous adaxially, persistent; petals four, narrowly obovate, 1.5–2.5 mm long, ca. 1 mm wide, glabrous, off-white; filaments eight, 2.5–4.0 mm long, anthers oblong, ca. 0.4 mm wide, glabrous; ovary lanate, ca. 1.5 mm long, the 2 styles divergent and each 1.5 mm long, basally pubescent but glabrous toward the tips. Capsules 3.0–3.5 mm long (not including style), lanate-villous; seeds oblong, ca. 1.0 mm long, sparsely covered with simple hairs 0.5 mm long.

*Ecology and distribution.* Occurring in patches of short forest on lower summit plateau overlying sandstone, known only from Ilú-tepui in the eastern tepui chain of Estado Bolívar, Venezuela, between 2500 and 2630 m elevation.

In the size and shape of leaves, inflorescences, flowers, and fruits, *Weinmannia ilutepuiensis* most closely resembles the Andean *W. rollottii* Killip, especially variety *testudineata* (Cuatrecasas) Bernardi. Both species belong to series Dryadifoliae Bernardi (Bernardi, 1963). However, *W. ilutepuiensis* differs in its dense, lanate-villous indumentum, including the calyx and the capsule (which are glabrous in *W. rollottii*).

On the same helicopter trip to Ilú-tepui during which Ronald Liesner collected the type specimen, he also made three other collections of *Weinmannia* (numbers *23422*, *23417*, and *23366*, all at MO). None of these additional collections fits easily into

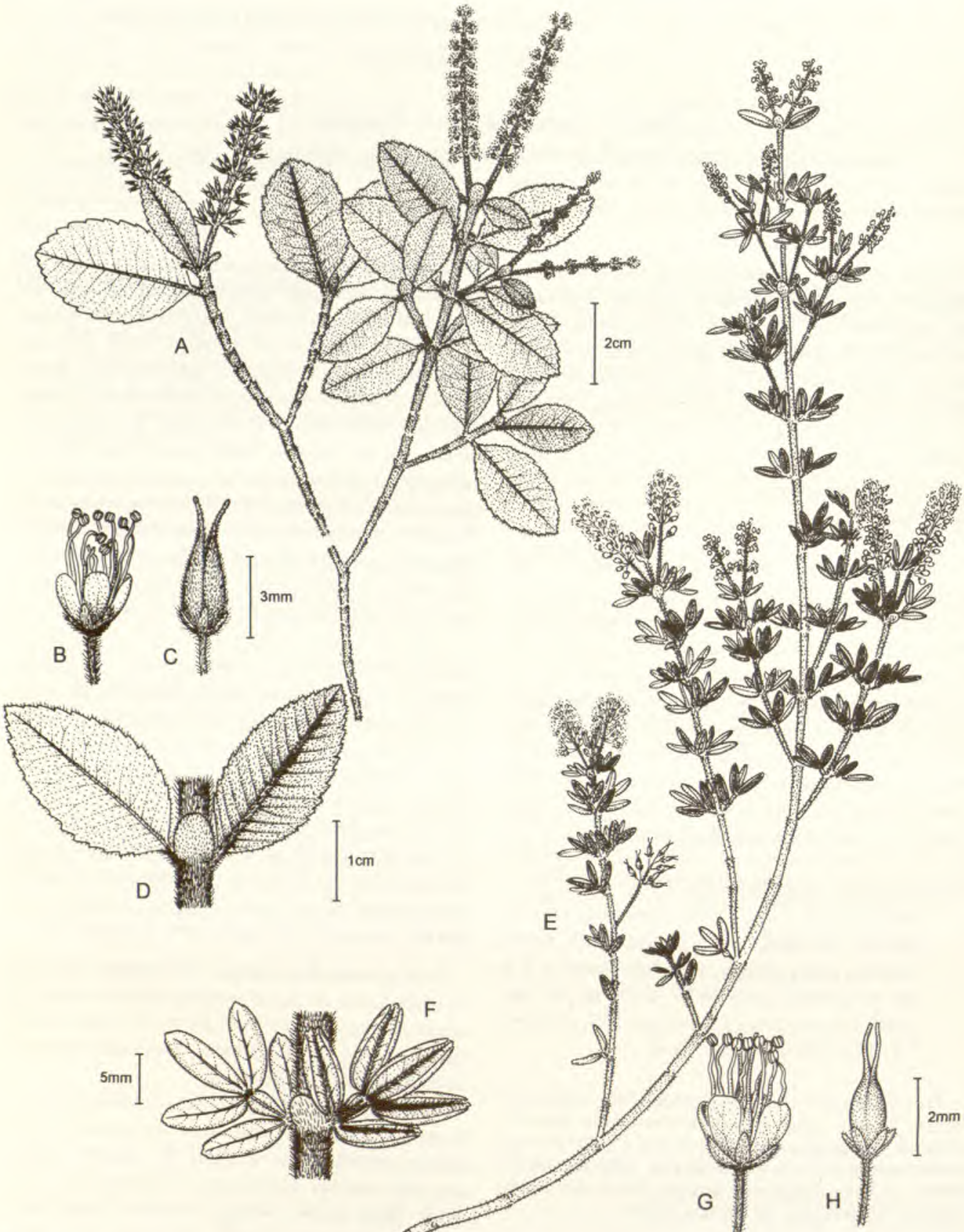


Figure 1. A–D. *Weinmannia ilutepuiensis* P. E. Berry & J. Bradford. —A. Habit. —B. Flower. —C. Fruit. —D. Detail of leaf pair and stipule. Drawn from *Liesner 23413* (flowering) and *23338* (fruiting). E–H. *Weinmannia corocoroensis* J. Bradford & P. E. Berry. —E. Habit. —F. Detail of leaf pair and stipule. —G. Flower. —H. Young fruit. Drawn from *Huber 12296*.

any known species, and they appear to be intermediates between *W. ilutepuiensis* and *W. brachystachya* Willdenow ex Engler. Since these two species are so different phenotypically (*W. brachystachya* is characterized by small, compound, glabrous leaves with pseudo-umbellate inflorescences), the apparent hybrids were only recognized when all Liesner collections from the area were seen together. *Weinmannia brachystachya* is not yet known from Ilú-tepui, but it does occur on the near-by Roraima-tepui.

*Paratypes.* VENEZUELA. **Bolívar:** Cumbre del Ilú-(Uru-)tepui, sector centro-meridional, vegetación herbáceo-fruticosa sobre superficies poco disectadas, 5°25′N, 60°59′W, 2630 m, 29 Apr. 1984, *Huber 9520* (MYF, US); Ilú-tepui, lower plateau, with varied habitats, rocky, boggy, and short forest to 5 m tall, 05°25′03″N, 60°29′W, 2500 m, 15 Apr. 1988, *Liesner 23338* (MO, US, VEN); Ilú-tepui, cumbre slopes, saddle between N peak and central plateau, 7000–7800 ft., 15 Mar. 1952, *Maguire 33426* (NY, US); Ilú-tepui, slopes below uppermost W-facing escarpment, 7500–8000 ft., *Maguire 33508* (NY, US).

**Weinmannia corocoroensis** J. Bradford & P. E. Berry, sp. nov. TYPE: Venezuela. Estado Amazonas: cumbre del Cerro Coro-Coro, en las cabeceras nor-occidentales del Río Manapiare (sector NW de la Serranía Yutajé), 05°46′N, 66°12′W, 2200 m, 12 Nov. 1987, *Otto Huber 12296* (holotype, MO; isotypes, MYF, VEN). Figure 1E–H.

A *Weinmannia guyanensi* Klotzsch foliolis subintegris valde revolutis, foliolo terminali lateralibus simili, inflorescentiis congestioribus, pubescentia densiore longioreque differt.

Shrub 0.5–1.5 m tall; young stems villous, the hairs 1–1.5 mm long. Leaves opposite, imparipinnate, rachis winged, rigid-coriaceous, leaflets 1- or 2-paired (occasionally unifoliate), the terminal and lateral leaflets elliptical to obovate, similar in size and shape, 5–12 mm long, ca. 3–5 mm wide when flattened but lateral margins strongly inrolled, lateral margins entire, apex generally with three small teeth, upper surface glabrous with hairs occasional along midvein, lower surface glabrous except for strigose hairs 1–1.5 mm long along midvein especially toward the base; secondary veins 6–9 per side, barely visible below, subparallel from midvein until divaricating within ca. 1 mm of the margin with each branch joining an adjacent branch and together forming a vein which extends to the margin; petioles 1–2 mm long, densely villous; stipules obovate, ciliate, hairs sparse on outer surface, glabrous on inner surface, 2–4 mm long, 1.5–3.5 mm wide. Pseudoracemes in axillary pairs near branch tips, exceeding the leaves, 20–30 mm long in flower, axis villous, the basal 8–12 mm sterile, the apical portion densely covered with flowers. Flowers arranged in fascicles along the inflorescence axis with 1–several flowers per fascicle; bracteoles subtending fascicles, rectangular, apex blunt, ciliate, 0.7–1 mm long, 0.5–0.8 mm wide; pedicels 1.5–3.0 mm long in flower, with sparse, shaggy hairs; sepals four, narrowly deltoid, acute, 1.0–1.5 mm long, hairs on midvein and apex; petals four, obovate, 1.5–2.0 mm long, ca. 1 mm wide, glabrous, white, with a prominent midvein divaricating near the apex; filaments eight, 2.0–2.8 mm long, anthers oblong, ca. 0.4 mm long, glabrous; gynoecium 1.5–1.8 mm long, glabrous, the two styles divergent, glabrous, ca. 1 mm long. Mature fruits not seen, recorded on labels as being red.

*Ecology and distribution.* Locally frequent in tepui scrub communities overlying sandstone and in high-tepui meadows along streams; known only from the summit of Cerro Coro Coro in Estado Amazonas, Venezuela, at 2200 m elevation.

*Weinmannia corocoroensis* resembles *W. guyanensis* Klotzsch, especially variety *quinata* Cuatrecasas, in its habit and leaf venation pattern, but differs in having denser, longer pubescence along the stems, nodes, and inflorescence structures; smaller, more revolute and nearly entire leaflets; terminal and lateral leaflets of the same size; and shorter, more congested inflorescences. This species was noted in the field by Otto Huber as being common, while another specimen (*Huber 12332*, MO) from the same location and apparently belonging to *W. guyanensis* was rare. *Weinmannia corocoroensis* is also similar to *W. brachystachya* Willdenow ex Engler in the few, apical teeth of the leaflets and in its shrubby habit, but differs in its more elongate inflorescence, denser pubescence (on stems, midveins of leaves, inflorescence axis, and petioles), more regularly elliptical leaflets, and more congested nodes on the stem.

*Acknowledgments.* This work was supported in part by National Science Foundation grant DEB-9201044. We thank José Cuatrecasas for sharing his knowledge of the genus *Weinmannia* with us and first suggesting that *W. ilutepuiensis* was a new species. Bruno Manara made the line drawings of the two species, and Roy Gereau kindly reviewed the Latin diagnoses.

Literature Cited

Bernardi, L. 1963. Revisio generis *Weinmannia*. Pars II: Sectio *Simplicifoliae*. Candollea 18: 285–334.

# New Combinations in Eastern North American *Elymus* (Poaceae)

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ABSTRACT. Two new varietal combinations are made in the grass genus *Elymus: E. glabriflorus* (Vasey) Scribner & Ball var. *australis* (Scribner & Ball) J. J. N. Campbell, and *E. villosus* Muhlenberg var. *arkansanas* (Scribner & Ball) J. J. N. Campbell.

The following new combinations have been found necessary in preparing the treatment of eastern *Elymus* species for the forthcoming *Manual of North American Grasses* (M. E. Barkworth & K. Capels, editors, in prep.).

**Elymus glabriflorus** (Vasey) Scribner & Ball var. **australis** (Scribner & Ball) J. J. N. Campbell, comb. nov. Basionym: *Elymus australis* Scribner & Ball, U.S.D.A. Div. Agrostol. Bull. 24: 46. 1901. TYPE: U.S.A. North Carolina: *Biltmore Herbarium 411b* (holotype, US).

**Elymus villosus** Muhlenberg var. **arkansanas** (Scribner & Ball) J. J. N. Campbell, comb. nov. Basionym: *Elymus arkansanas* Scribner & Ball, U.S.D.A. Div. Agrostol. Bull. 24: 45. 1901. TYPE: U.S.A. Arkansas: *Harvey 7* in part (holotype, US).

In most recent treatments, these taxa have generally been recognized at the forma level or not at all. The morphological differences are largely a matter of presence or absence of pubescence in the spike. However, each taxon is locally more frequent than typical plants of the species, and there appear to be some associations with different habitats and some geographic trends.

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# *Festuca diclina* (Poaceae), a New Species from Northwestern Mexico

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ABSTRACT. A series of collections from Guadalupe y Calvo in southern Chihuahua State, Mexico, is described as a new species, *Festuca diclina* (Poaceae), and compared with similar species from Central America.

**Festuca diclina** S. J. Darbyshire, sp. nov. TYPE: Mexico. Chihuahua: Mpio. Guadalupe y Calvo, Cerro de Mohinora, S de Guadalupe y Calvo, 3300 m, alpina-subalpina, en ladera rocosa, 27 Aug. 1987, *McDonald & Martinez 2392* (holotype, DAO 661232; isotypes, TEX (ex DAO 591464), MEXU (ex DAO 592610)). Figure 1.

Plantae perennes caespitosae, innovationibus intravaginalibus praeditae. Vaginae foliorum ima basi tantum integrae, vertice scabrae; ligulae 0.2–0.5 mm longae; laminae foliorum plicatae vel convolutae, 1.2–1.5 mm latae, abaxialiter ima basi scabrae, adaxialiter sparsim scabrae, 5–7-costatae, fasciculis sclerenchymaticis cum nervis infra et saepe supra conjunctis, non confluentibus. Culmi 30–75 cm longi, glabri. Paniculae 8–15 cm longae, plus minusve laxae, pyramidales, axe et ramulis glabris vel trichomatibus sparsis, ramulis interdum tortuosis. Spiculae 8–12 mm longae, (2–)3–4(–5) flosculis; glumae inferiores 2.4–4 mm longae, 1-nerviae; glumae superiores 3.5–5 mm longae, (1–)3-nerviae; rachillae trichomatibus 0.1–0.3 mm longae praeditae; lemmata lanceolata, glabra vel apice scabra, 1–3(–5)-nervia, 6–8 mm longa, interdum arista ad 1.0 mm longa; paleae 5.5–7 mm longae, bidentatae, apice piloso-hirsutae inter nervos, nervis cum trichomatibus 0.1–0.2 mm longis prope apicem; antherae interdum abortivae praesertim flosculis inferioribus, 3–4.2 mm longae; ovariorum apex dense pubescens.

Caespitose, loosely tufted perennial (Fig. 1A); shoots intravaginal. Vegetative shoots to 25 cm tall, light green (not glaucous); sheaths rapidly decaying to fibers, the margins closed only at the base, the upper parts of the sheaths, collars, and lower abaxial blade surface retrorsely scabrous; auricles absent; ligules short, 0.2–0.5 mm long, acute to truncate, sometimes lacerate, puberulent apically and abaxially, membranous; blades plicate to convolute, adaxially sparsely scabrous, 1.2–1.5 mm wide on flattened blades (about 0.4–0.8 mm in the longest dimension of a cross section), with 7(–9) veins and 5–7 adaxial ribs; sclerenchyma in discrete fascicles opposite veins abaxially and usually adaxially (Fig. 2A–C), the fascicles usually joining veins abaxially and sometimes adaxially thus forming a girder between the epidermises through the veins (Fig. 2A). Culms 30–75 cm tall, glabrous; nodes black or brown, glabrous. Flag leaf sheath sometimes loose. Panicle open, pyramidal, 8–15 cm long; rachis glabrous below and sparsely scabrous on the angles above; branches ± flexuous and sometimes sinuously undulating, 1 or 2 per node, glabrous or sparsely scabrous, the lowest 5–9 cm long. Spikelets 8–12 mm long, distal on the branches, with (2–)3–4(–5) florets; glumes chartaceous, glabrous or scabrous on the keel (especially apically), ovate-lanceolate to lanceolate with wide hyaline margins; lower glume 2.4–4 mm long, 1-nerved; upper glume 3.5–5 mm long, (1–)3-nerved; rachilla with hairs 0.1–0.3 mm long (Fig. 1C); lemmas 6–8 mm long, narrowly lanceolate (Fig. 1B), glabrous or scabrous-hirsute apically, 1–3(–5)-nerved (the lateral ones faint), the apex attenuate, sometimes with a terminal awn or mucro to 1.0 mm long; paleas subequal to the lemmas, 5.5–7 mm long, bidentate, apically pilose-hirsute between the nerves and with hairs 0.1–0.2 mm long on the nerves (Fig. 1D, E); anthers sometimes abortive especially in lower florets, 3–4.2 mm long when developed; ovary apex densely pubescent (Fig. 1F); styles 2. Caryopses not seen.

Specimen label data from the type collection describe the culms as up to 2 m high, although all specimens examined were much less.

*Distribution.* Collections of *Festuca diclina* are known only from the vicinity of Guadalupe y Calvo, Sierra Madre Occidental, Mexico, in montane pine forests at altitudes of 2950–3300 m.

*Festuca diclina* belongs to *Festuca* subg. *Festuca* and is similar to *F. hintoniana* E. B. Alexeev (Figs. 1G–K, 2D) but differs primarily in the loose tufts with non-persistent sheaths decaying to separate fibers (densely tufted with persistent chartaceous sheaths in *F. hintoniana*), scabrous upper sheaths, collars, and lower leaf blades (not glabrous), narrower leaf blades (1.6–1.9 mm on flattened blades and 0.7–1.0 mm in longest dimension of transverse section in *F. hintoniana*), blade sclerenchyma in discrete fascicles (more or less continuous abaxial

A
G
B
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K
Figures A, G 1 cm
Figures B, D, H, J 1 mm
Figures C, E, F, I, K 1 mm

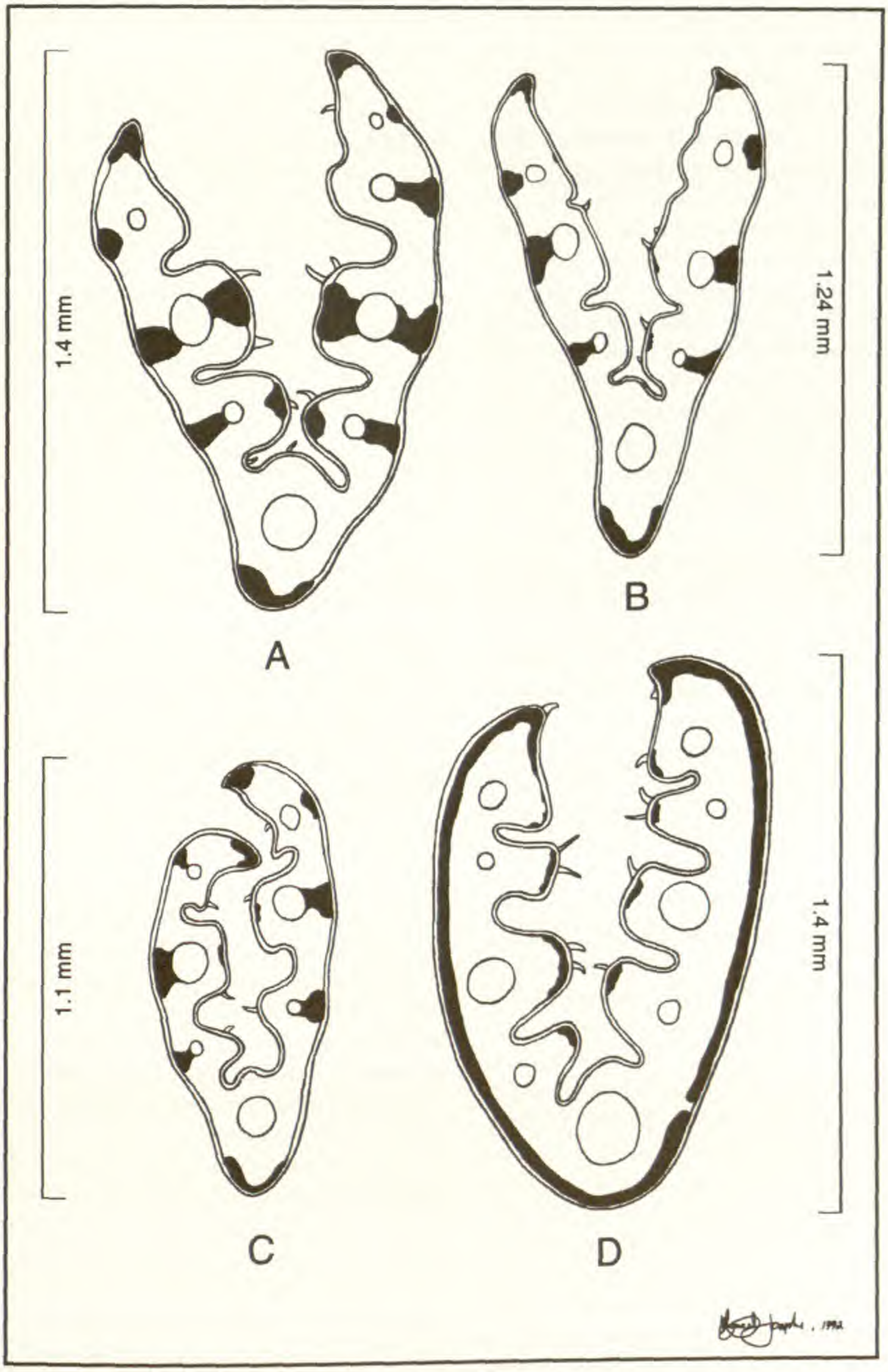


Figure 2. Camera lucida drawings of cross sections of mature leaves from vegetative shoots. —A–C. *Festuca diclina* S. J. Darbyshire. —D. *F. hintoniana* E. B. Alexeev. (A based on *McDonald & Martinez 2392* (TEX), B based on *McDonald & Nesom 2475* (ARIZ 285274), C based on *Nesom & McDonald 6473* (ARIZ 281336), D based on *Hinton 17243* (K).)

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Figure 1. *Festuca* species. A–F. *F. diclina* S. J. Darbyshire. —A. Habit. —B. Lower floret. —C. Rachilla. —D. Palea. —E. Palea apex. —F. Ovary. G–K. *F. hintoniana* E. B. Alexeev. —G. Habit. —H. Lower floret. —I. Rachilla. —J. Palea. —K. Palea apex. (A composite, B–F based on *McDonald & Nesom 2489* (DAO 592613), G–K based on *Hinton 17243* (K).)

band in *F. hintoniana;* Fig. 2D), which extend inward to meet vascular bundles, sclerenchyma fascicles of the blades visible from the abaxial surface (invisible or very faint in *F. hintoniana*), longer rachilla hairs (0.05–0.07 mm in *F. hintoniana;* Fig. 1I), longer hairs on the palea veins (scabrous prickles 0.02–0.05 mm in *F. hintoniana;* Fig. 1K) and pilose-hirsute apically between the palea veins (glabrous in *F. hintoniana*). The Mexican species *F. coahuilana* González-Ledesma & S. D. Koch is distinguished from *F. diclina* by the longer ligules (to 1 mm), which form erect auricular projections, wider leaf blades (1.5–2.2 mm) with 8–11 nerves, erect inflorescence branches, shorter lemmas (5.0–6.2 mm), and shorter anthers (2.5–2.7 mm). Two taxa recently described from Costa Rica, *F. herrarae* Davidse and *F. talamancensis* Davidse, are both readily distinguished from *F. diclina* by their glabrous ovaries and shorter anthers (less than 2.1 mm long). *Festuca diclina* is known from the Sierra Madre Occidental of northwestern Mexico, while both *F. hintoniana* and *F. coahuilana* are known only from the Sierra Madre Oriental in northeastern Mexico.

This species is so named because the lower florets within a spikelet frequently contain abortive anthers, while the upper florets frequently contain apparently abortive ovaries.

*Paratypes.* MEXICO. **Chihuahua:** Mpio. Guadalupe y Calvo, NW side of Cerro Mohinora, ca. 13 mi. SW of Guadalupe y Calvo, 25°57′N, 107°03′W, open pine-fir woods with scattered spruce, top and near top of summit, open rocky slopes at lip of precipice with scattered krumholz [sic] pines, 3250 m, 21 Aug. 1988, *McDonald & Nesom 2489* (ARIZ 285277, DAO 592612, 592613); NW side of Cerro Mohinora, ca. 13 mi. SW of Guadalupe y Calvo, 25°57′N, 107°03′W, open pine-fir woods with scattered spruce, top and near top of summit, open rocky slopes at lip of precipice with scattered krumholz pines, 3250 m, 21 Aug. 1988, *McDonald & Nesom 2475* (ARIZ 285274, DAO 592611); N side of Cerro Mohinora, ca. 13 mi. SW of Guadalupe y Calvo, 25°57′N, 107°03′W, open pine-fir woods with scattered spruce, nearly vertical N-facing rock wall, very moist with many bryophytes and rich herbaceous flora, 2950 m, 20 Aug. 1988, *Nesom & McDonald 6473* (ARIZ 281336, TEX).

*Acknowledgments.* I am grateful to Andy McDonald for sending material from his collections, J. Cayouette and John and Charlotte Reeder for useful comments, James E. Darbyshire for assistance with the Latin description, Marcel Jomphe for the illustrations, and herbarium curators at ARIZ, DAO, K, and TEX for making specimens available for study.

# Three New Species of *Rustia* (Rubiaceae, Condamineeae) from Panama and Ecuador

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ABSTRACT. Three new species of *Rustia* are described, two from Ecuador (*R. alba* and *R. viridiflora*) and one from Panama (*R. dressleri*). Illustrations of the three species are provided.

RESUMEN. Se describen tres especies nuevas de *Rustia*, dos de Ecuador (*R. alba* y *R. viridiflora*) y una de Panamá (*R. dressleri*). Se incluyen ilustraciones de las tres especies.

*Rustia* (Cinchonoideae, Condamineeae; Hooker, 1873; Robbrecht, 1988; Delprete, in prep.) is a genus of trees and shrubs that was founded by Johann Friedrich Klotzsch, curator of the Berlin herbarium in the mid-1800s. Klotzsch (1846) separated *Exostema formosum* Chamisso & Schlechtendal to establish *Rustia*, in honor of Dr. Rust ("Dem Andenken des verstorbenen Präsidenten Dr. Rust gewidmet"). *Rustia*, along with *Tresanthera* H. Karsten, is unique in the woody Rubiaceae in having poricidal anthers and pellucid-punctate leaves. *Rustia* comprises approximately 15 species endemic to tropical America, from Nicaragua to southern Brazil. The only previous work on *Rustia* was published by Donald R. Simpson (1976), but this was restricted to only a few species of western South America.

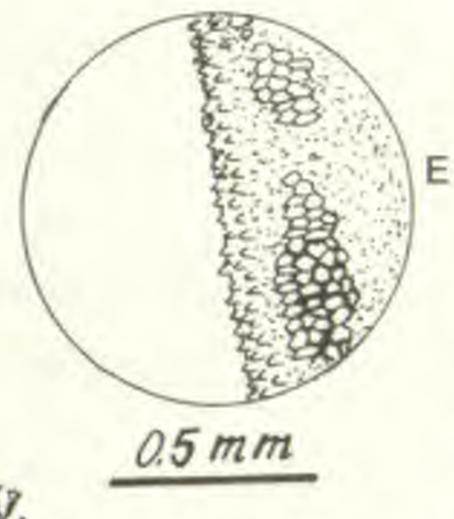
During preparation of a monographic treatment of the tribe Condamineeae (Delprete, in prep.), I examined several herbarium specimens from poorly collected areas of Central and South America, many of them unidentified or incorrectly identified. Among these collections, I encountered three species new to science, two from Ecuador and one from Panama.

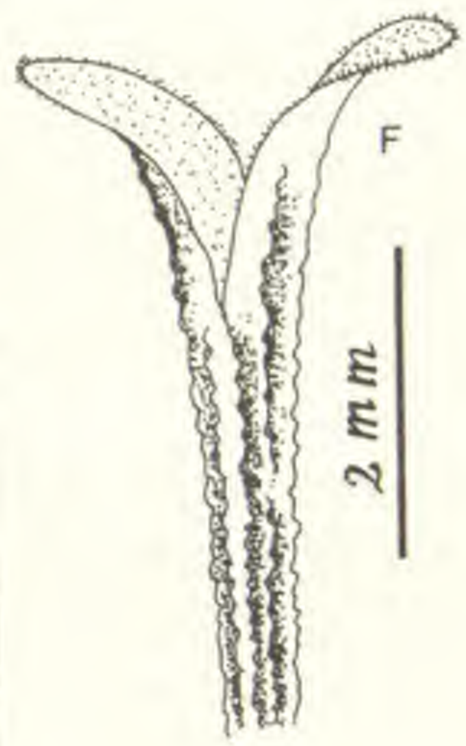
In the following descriptions I use the abbreviations L/W to represent the length to width ratio of the leaf blades, and BA to represent the basal angle from the leaf margin to the midrib.

**Rustia alba** Delprete, sp. nov. TYPE: Ecuador. Carchi: environs of Maldonado, wet montane forest, 1450–1650 m, 31 June 1978, *M. T. Madison 4808 with T. C. Plowmann, H. A. Kennedy & L. Besse* (holotype, AAU; isotypes, F, QCA, SEL not seen, US). Figure 1.

Arbores vel frutices glabri; stipulae interpetiolares caducae. Foliorum laminae 23–28 cm longae, 13–16 cm latae, glanduli-punctatae; domatia desunt. Inflorescentia 40–46 cm longa; alabastra floralia cylindrica aestivatione valvati-reduplicata; calyx cupulatus ac membranaceus 1.5–3.0 mm longus; corolla alba 1.5–1.9 cm longa ad basim constricta lobis ⅔ longitudinis corollae; antherae exsertae dorsifixae concavae poricidales, thecae ad basim subaequalis; filamentis basiliter dilatatis ascendenti-strigosisque. Capsulas non visi.

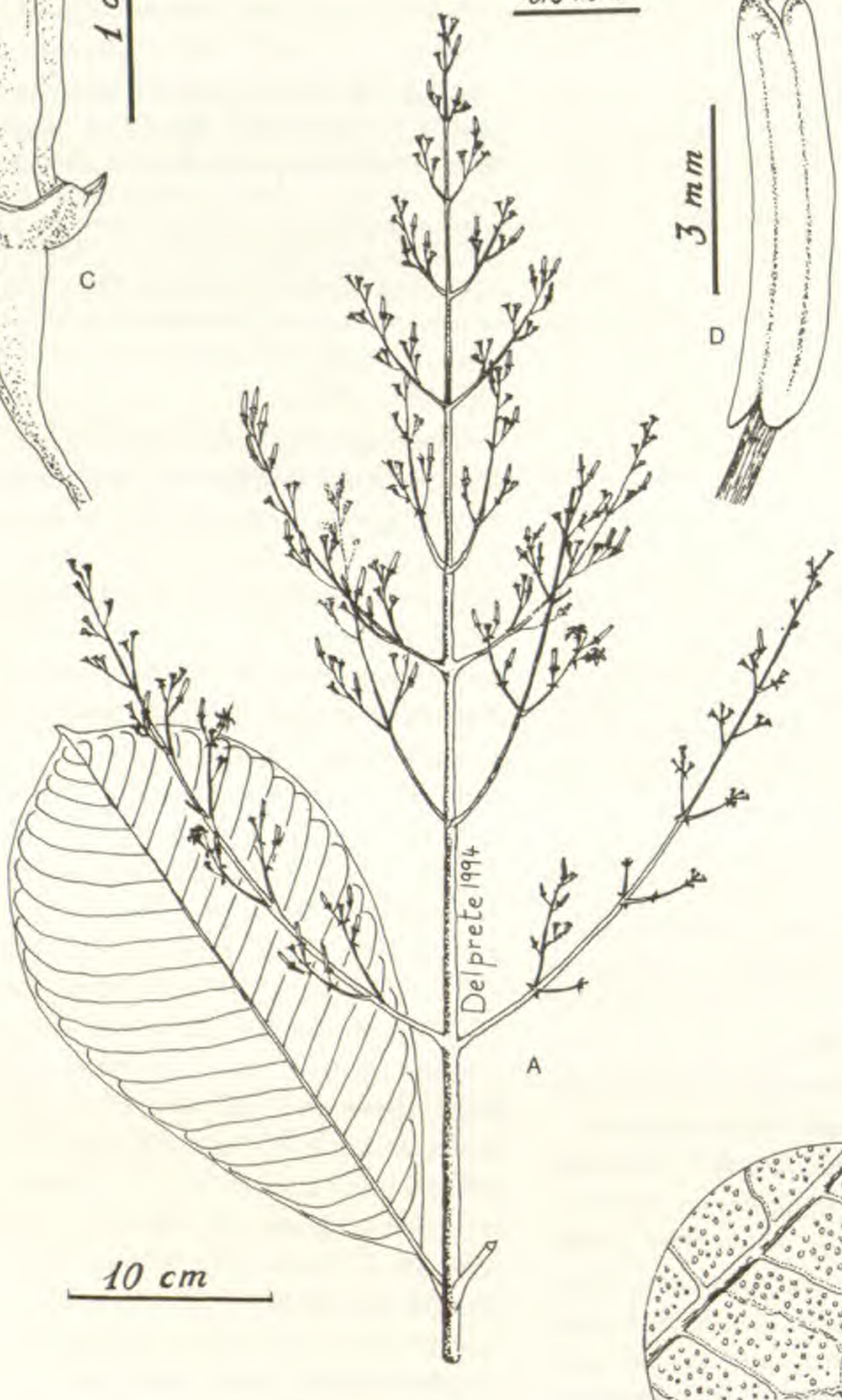
*Shrub or tree*, with several straight trunks 6 m tall (probably stump sprouts). Young branches smooth, glabrous, terete; older branches rugose, terete, grayish to pale brown and with sparse lenticels. *Stipules* interpetiolar, free at base, present only in bud and overlapping, narrowly triangular, glabrous outside, glabrous and with few basal colleters inside, 2.8–3.7 mm long, 7–9 mm wide at base, reddish green, leaving a linear scar ca. 0.5 mm wide of the same color as the stem. *Leaves* petiolate, petioles 2–3 cm long, 3.0–4.5 mm thick, adaxially narrowly concave to flattened, glabrous; basally thickened, not pulvinate; blade 23–28 cm long, 13–16 cm wide, L/W = 1.6:1 to 1.7:1; widely elliptic to widely obovate, acute to rounded at base (BA = 30–45°), obtuse and short-acuminate at apex; the acumen up to 1 cm long; blade when fresh pale green above and yellowish green below, subcoriaceous, drying pale green, glabrous above and below, pellucid punctate (see Fig. 1). Primary and secondary veins glabrous and prominent below, secondary veins 16–21 each side; tertiary veins starting subparallel and openly reticulate in the center, faintly evident above and below; domatia absent. *Inflorescences* terminal, laxly paniculate and pyramidal, 40–46 cm long, basal branches 22–30 cm long, lateral branches 6–8 pairs, decussate; basal portion of axis not branched, 7–11 cm long. Rachis terete, rachis and branches glabrous to minutely hirtellous; flowers on distal branches in cymules (rarely alternate). Distal bracts 4–5 mm long, 4–5 mm wide, deltoid; bracteoles subtending the flowers 2–3 mm long, 2–3 mm wide, deltoid, glabrous. *Flowers* protandrous, pedicellate, pedicel 4–6 mm long, glabrous to minutely puberulent; hypanthium narrowly obconical, 4–6 mm long, 2–3 mm wide, glabrous. *Calyx* cupular with small lobes, membranous and









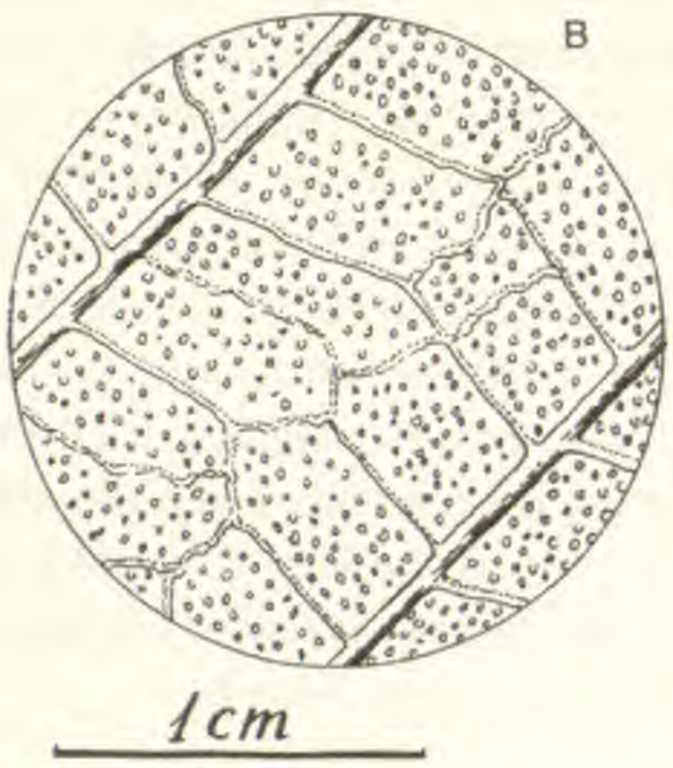




Figure 1. *Rustia alba* Delprete. —A. Habit of inflorescence with mature leaf. —B. Abaxial view of blade showing pellucid punctation. —C. Flower bud showing cupular calyx. —D. Anther. —E. Detail of anther external surface. —F. Style. (Drawn from type: *Madison et al. 4808.*)

glabrous, 1.5–3.0 mm long, calyx lobes 5, 1.0–2.5 mm long and 1.5–2.0 mm wide at base, glabrous and ciliolate; calyx persistent. *Corolla* tubular, 1.5–1.9 cm long, with a basal constriction and reflexed lobes, flower bud cylindrical and pointed at apex, aestivation valvate with contact zone, white, and semifleshy when fresh; tube subcylindrical with basal constriction, 5–6 mm long, ca. 2 mm wide at base and 3.5–4.0 mm wide at the orifice; glabrous and minutely verrucose outside; microscopically (40×) granulose inside, without a ring of hairs; corolla lobes 5, 9–11 mm long, ca. 3 mm wide, narrowly triangular and reflexed, glabrous and minutely verrucose outside; densely ascending short-strigose at base, minutely papillose throughout and microscopically (40×) papillose at margins inside. Lobes ⅔ of corolla length. *Stamens* 5, fully exserted, subequal, filaments attached 4–5 mm from the base of the tube, anthers cylindrical and subsagittate at base (see Fig. 2), rectilinear to slightly curved, 6.5–7.0 mm long, ca. 1.5 mm wide, dorsifixed near the base, the thecae subequal at base, papillose throughout, dehiscing by two pores at apex; filaments ca. 3 mm long, flattened and widened at base, with a basal tuft of ascending strigose hairs 0.3–0.5 mm long. *Style* exserted, 16–20 mm long, glabrous, style branches ovate, 3.0–3.5 mm long and 1.0–1.3 mm wide at base, stigmatic surface papillose. *Ovary* two-celled, placentation axile, turbinate to narrowly oblong, glabrous, with many ovules in each locule horizontally inserted. *Capsule* not seen, but probably obconical to obovoid, like the hypanthium.

*Rustia alba* is similar to *R. formosa* (Chamisso & Schlechtendal) Klotzsch but differs mainly in having a bigger inflorescence (exceptionally up to 36 cm long in *R. formosa*), smaller flowers; calyx cupular, more expanded and membranous; shorter styles; and longer membranous style lobes (ca. 3 mm long in *R. alba* vs. ca. 1 mm long in *R. formosa*).

*Rustia alba* is known only from the type, which was collected in the cloud forest of northern Ecuador, around Maldonado; in contrast, *R. formosa* is endemic to central and southern Brazil. *Rustia alba* is easily distinguishable from all other species of *Rustia* in western South America by its white erect flowers (hence the epithet) and by its widely obovate leaves.

**Rustia viridiflora** Delprete, sp. nov. TYPE: Ecuador. Morona–Santiago: Achutza, Jibaro settlement in the vicinity of Macuma, ca. 50 km N of Macas, 23 Mar. 1973, *H. Lugo 3674* (holotype, GB sheets A and B). Figure 2.

Arbores usque ad 16 m altae; stipulae interpetiolares caducae. Foliorum laminae 34–62 cm longae, 9.5–20.5 cm latae, glandulis punctatae; domatia desunt. Inflorescentia 22–54 cm longa, paniculata et secundiflora; alabastra floralia cylindrica acuminata, aestivatione valvati-reduplicata; calyx valde redactus 0.3–0.5 mm longus truncatus; corolla viridis 1.9–2.2 cm longa, lobis ¼–⅕ longitudinis corollae ad basim bulbosa; antherae rectae pilosae inclusae poricidales basaliter subcaudatae dorsifixae prope basim; filamenta tereta ad basim aurei-pilosa. Capsulae angustissime obconicae 18–23 mm longae disco conico.

*Tree* 6–16 m tall. Young branches glabrous to minutely puberulent, terete; older branches becoming glabrous, rugulose, terete, grayish to pale brown and with sparse punctiform to linear lenticels, up to 1.0 cm long. *Stipules* not seen, probably interpetiolar and free at base (observed from stem scars), leaving a linear scar 1.0–1.5 mm wide, of the same color as stem. *Leaves* petiolate, petiole 4.5–7.0 cm long, 3–5 mm thick, subterete, glabrous; basally thickened, not pulvinated; blade 34–62 cm long, 9.5–20.5 cm wide, L/W 3:1 to 3.5:1; lanceolate to elliptic, acute to obtuse (BA = 35–65°) at base, acute to attenuate at apex, sometimes tapering to an acumen 2–3 cm long; blade when fresh dark green above and dull green below; drying pale brown, stiff-chartaceous; glabrous above and below, pellucid punctate (see Fig. 2). Primary and secondary veins glabrous and prominent below, secondary veins 19–25 each side; tertiary veins starting subparallel and openly reticulate in the center, faintly evident above and fairly evident below; domatia absent. *Inflorescences* terminal, 22–54 cm long, 9–22 cm wide at base, laxly paniculate and pyramidal, with decussate racemoid lateral branches; lateral branches 3–7 pairs, basal portion of axis not branched, 10–20 cm long. Rachis terete to decussately obtuse-compressed, rachis and branches glabrous to minutely puberulent; flowers on distal racemoid branches or on racemoid cymules. Bracts subtending lateral branches 1–3 mm long, 2–3 mm wide, deltoid; bracteoles subtending the flowers 0.5–1.0 mm long, 0.7–1.0 mm wide, deltoid, glabrous. *Flowers* protandrous, pedicellate, pedicel 6–9 mm long, glabrous to minutely puberulent; hypanthium narrowly obconical, 4–6 mm long, 2–4 mm wide, glabrous to minutely golden hirtellous. *Calyx* reduced to a wavy margin with barely distinguishable lobes, 0.3–0.5 mm long and persistent. *Corolla* tubular with bulbous base and small constriction just above, 1.9–2.2 cm long, flower bud cylindrical, aestivation valvate with contact zone, color green throughout (rarely reddish with green lobes), semifleshy when fresh; tube subcylindrical and striate, 1.4–1.8 cm long, 4–5 mm wide at base and 2.0–2.5 mm wide at the orifice, glabrous

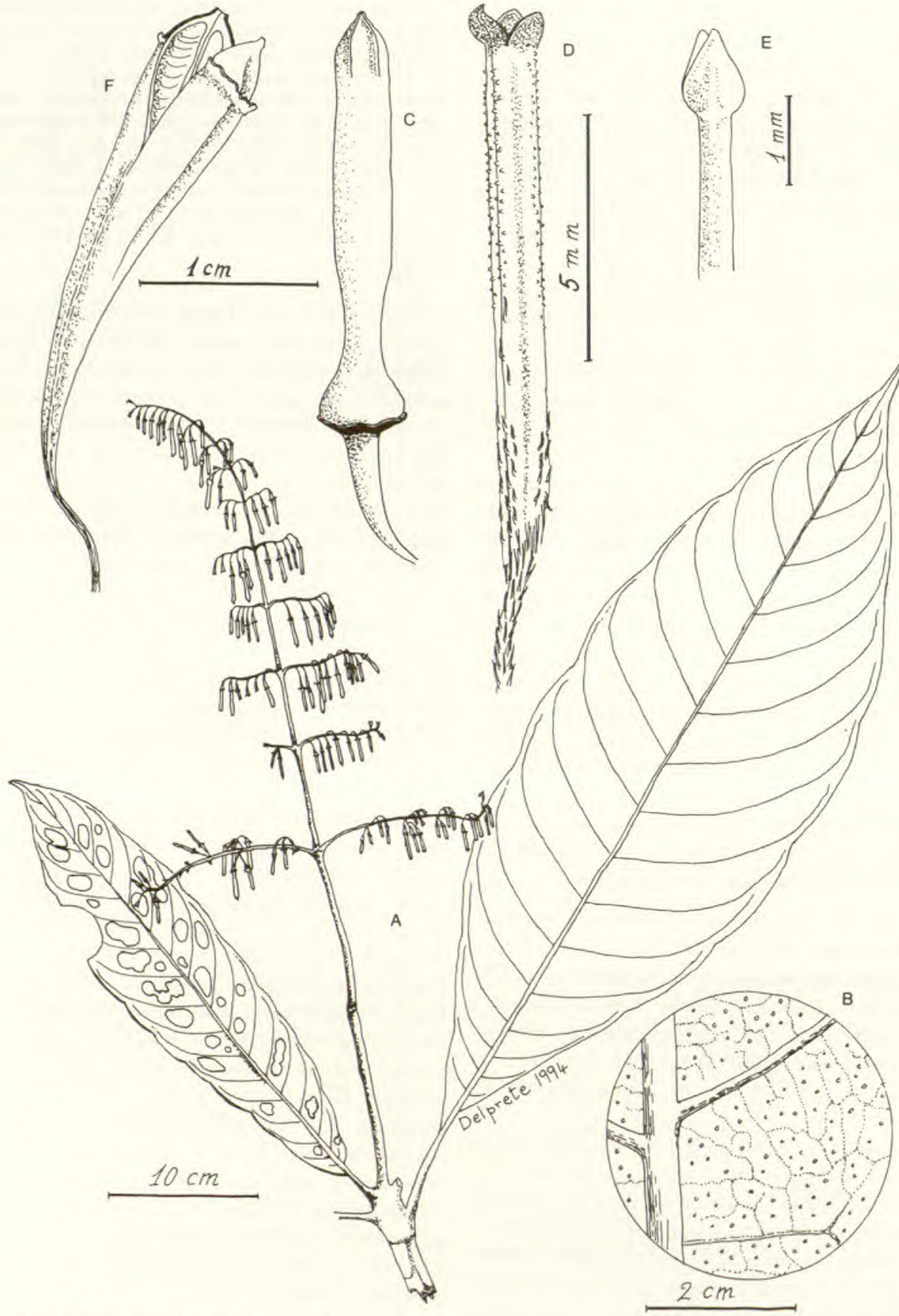



Figure 2. *Rustia viridiflora* Delprete. —A. Habit of inflorescence with mature leaves. —B. Abaxial view of blade showing pellucid punctation. —C. Flower bud showing bulbous base. —D. Anther. —E. Style. —F. Mature capsule showing conical disk. (Drawn from holotype: *H. Lugo 3674*, sheets A and B; capsule drawn from paratype: *F. Prieto CHUP-20.*)

or golden hirtellous outside; ascending strigose at base inside, without a ring of hairs, the remaining medial and superior zone glabrous or with sparse hairs; corolla lobes 5, 3–5 mm long, ca. 2.5 mm wide at base, triangular to ovate, glabrous outside, glabrous and with minute glandular hairs (hairs up to 0.5 mm long) at margins inside. Lobes ¼ to ⅕ of corolla length. *Stamens* 5, included (only the very tip exserted), subequal, filaments attached 3.5–5.5 mm from the base of the tube, anthers elongated and rectilinear, 11–12 mm long, 1.2–1.3 mm wide, dorsifixed near the base, base subcaudate, with sharp ridges, papillose-echinate to ascending-strigulose and descending glandular-pilose at base; dehiscing by two pores at apex; filaments 6–7 mm long, sparse ascending-pilose and with a tuft of golden pilose hairs at base. *Style* exserted, 22–28 mm long, glabrous and minutely verrucose throughout, style branches ovate and acute at apex, 1.0–1.3 mm long, stigmatic surface smooth to minutely papillose. *Ovary* two-celled, placentation axile, turbinate to narrowly obconical, glabrous, with many ovules in each locule horizontally inserted. Immature fruits green to reddish. *Capsules* very narrowly obconical (see Fig. 2), apex shortly conical, (14–)18–23 mm long, 4–6 mm wide, black and without lenticels, capsule and disk black and glabrous, disk obviously exceeding the calyx; dehiscing loculicidally, disk-septicidal dehiscence absent even in old capsules.

*Rustia viridiflora* is unique in the genus in having basally bulbous green flowers and capsules very narrowly obconical with a conical disk. It is known from the eastern slopes of the southern Ecuadorian Andes (Prov. Morona–Santiago), at the western margin of the Amazon forest.

*Paratype.* ECUADOR. **Morona–Santiago:** low hills W of Río Chupiangas, 20–22 Nov. 1944, *F. Prieto CHUP-20* (NY [2], US).

**Rustia dressleri** Delprete, sp. nov. TYPE: Panama. Panamá: El Llano–Cartí Highway, 8–10 km N of El Llano, 31 Aug. 1974, *R. Dressler 4703* (holotype, MO). Figure 3.

Arbores vel frutices; stipulae interpetiolares caducae. Laminae 30–45 cm longae, 9.5–13.0 cm latae, glandulipunctatae; domatia desunt vel tricomata pauca brevia praesentia. Inflorescentia 12–21 cm longa paniculata; alabastra floralia clavata, aestivatione valvati-reduplicata; calyx valde redactus ca. 0.5 mm longus truncatus; corolla alba 1.2–1.4 cm longa lobis ½ longitudinis corollae; antherae exsertae poricidales concavae basaliter rotundatae dorsifixae prope basim; filamenta basaliter dilatata ad basim descendens-pilosa. Capsulas non visi.

*Shrub or tree* (specimen collected from fallen branches). Young branches grayish, glabrous, terete; older branches glabrous, rugose, terete, pale brown-grayish, lenticels absent; leafy branchlets semisucculent, 7–9 mm wide. *Stipules* not seen, interpetiolar, free at base (observed from stem scars), leaving a linear scar ca. 1 mm wide, of the same color as stem. *Leaves* petiolate, petioles 28–32 mm long, ca. 3.0 mm thick, adaxially concave to flattened, glabrous; thickened and becoming corky at base; blade 30–45 cm long, 9.5–13.0 cm wide, L/W 3:1 to 4:1; narrowly elliptic to oblanceolate, cuneate (BA = 20–25°) at base, acute and acuminate at apex, the acumen ca. 1 cm long; blade when fresh shiny grass-green above and pale grayish green below, subcoriaceous; drying olive-green, semicoriaceous; glabrous above and below; evidently pellucid punctate (see Fig. 3). Primary and secondary veins glabrous and prominent below, secondary veins 24–30 each side, subparallel; tertiary veins starting subparallel and openly reticulate in the center, very evident above and faintly evident below; domatia absent or a tuft of few hairs. *Inflorescences* terminal, 12–21 cm long, reduced panicles with opposite decussate branches; basal branches 6.5–11.0 cm long, lateral branches 4–5 pairs, basal portion of axis not branched, 0.9–2.0 cm long. Rachis decussately compressed and terete at base, rachis and branches semisucculent, glabrous throughout and moderately puberulent at nodes; flowers in opposite cymules on rachis and lateral branches. Distal bracts subtending lateral branches 2.5–3.0 mm long, 3–4 mm wide, deltoid, glabrous; bracteoles subtending the flowers 1.0–1.5 mm long, 1–2 mm wide, deltoid, glabrous. *Flowers* protandrous, subsessile or pedicellate, pedicel 0.5–4 mm long, glabrous; hypanthium obconical, 2.5–3.5 mm long, 2.0–2.5 mm wide, glabrous. *Calyx* extremely reduced, with a wavy margin or with barely distinguishable lobes, ca. 0.5 mm long, sometimes ciliolate, persistent. *Corolla* tubular with spreading lobes, 1.2–1.4 cm long; flower bud clavate, ca. 2.5 mm at base and 3.5–4.0 mm at bulge; aestivation valvate with contact zone, color white, semifleshy when fresh; tube 7–8 mm long, 2.5 mm wide at base and 3.5–4 mm wide at the orifice, glabrous outside, glabrous inside and with a ring of white-pilose retrorse to erect hairs, 5–6 mm from the base, at the point of attachment of the filaments, which is also the base of the corolla lobes; corolla lobes 5, 5–6 mm long, ca. 3 mm wide, triangular, semifleshy, glabrous outside, white-strigose at base and margins microscopically (40×) papillose inside. Lobes ca. ½ of corolla length. *Stamens* 5, partially exserted because of narrowly spreading lobes, subequal, filaments attached 5–6 mm from the base of the tube, anthers concave, yellow and banana-shaped, 4–5 mm long,

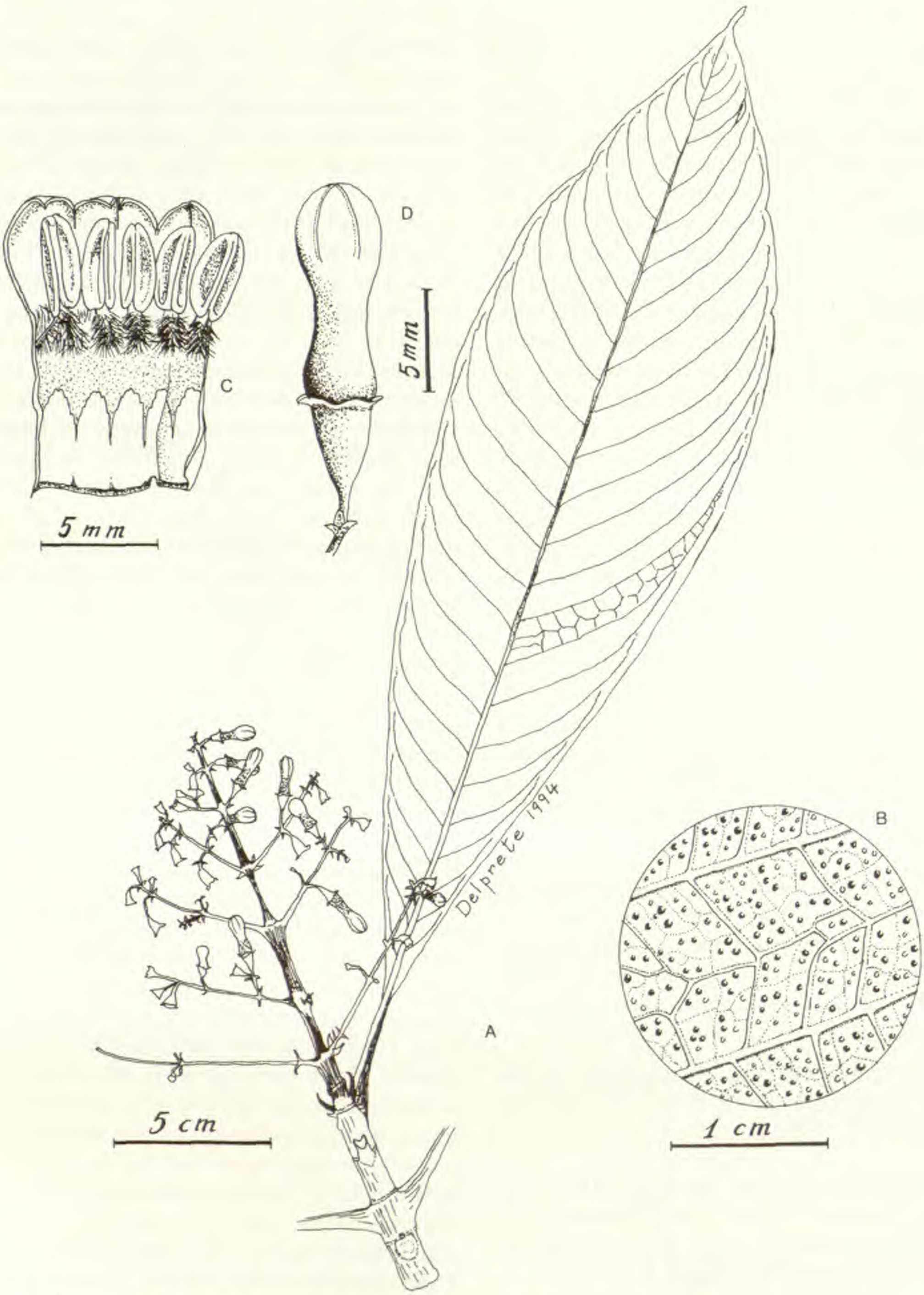



Figure 3. *Rustia dressleri* Delprete. —A. Habit of inflorescence with mature leaf. —B. Abaxial view of blade showing pellucid punctation. —C. Detail of open flower showing callous base and descending pilose tufts. —D. Flower bud. (Drawn from holotype: *Dressler 4703*.)

1.8–2.0 mm wide, dorsifixed near the base, bases of thecae rounded and subequal, microscopically (40×) papillose-echinate throughout, dehiscing by two pores at apex; filaments ca. 2 mm long, distally terete and basally flattened, adnate to tube, glabrous throughout and barbate at base, with a tuft of descending white-pilose hairs 0.1–0.2 mm long (see Fig. 3). *Style* exserted, 13–16 mm long, glabrous, style branches ovate to narrowly ovate, ca. 1.5 mm long, stigmatic surface smooth. *Ovary* two-celled, placentation axile, obconical, with many ovules in each locule horizontally inserted. *Capsule* not seen.

*Rustia dressleri* is very closely related to *R. occidentalis* (Bentham) Hemsley in having fleshy clavate buds, but differs in having white flowers (flesh-red to purple in *R. occidentalis*), filaments with basal tuft of descending white-pilose hairs (puberulent in *R. occidentalis*), larger inflorescences (up to 11 cm long in *R. occidentalis*), young branchlets thick and semisucculent, the whole plant glabrous, leaf blades 30–45 cm long (exceptionally up to 30 cm in *R. occidentalis*), and with 24–30 secondary veins each side (11–16 in *R. occidentalis*).

In his treatment of Rubiaceae for the *Flora of Panama*, Dwyer (1980) erroneously cited the paratype of *Rustia dressleri* (*Dressler 4749*) as *R. panamensis* Dwyer. The latter was subsequently reduced to synonymy under the new combination *R. costaricensis* (Standley) Lorence (Burger & Taylor, 1993).

*Rustia dressleri* differs from *R. costaricensis* in its inflorescence 12–21 cm long (vs. 20–33 cm long in *R. costaricensis*), twice compound (vs. thrice compound in *R. costaricensis*), with 4–5 pairs of lateral branches (vs. 8–11 pairs in *R. costaricensis*), flower bud clavate (vs. pointed in *R. costaricensis*), corolla tubular (vs. cupular in *R. costaricensis*) and 12–14 mm long (vs. 3–4 mm long in *R. costaricensis*).

Known only from two collections, this species was first encountered by Robert L. Dressler as fallen branches along a stream. Dressler is a well-known orchidologist, and I am pleased to honor him with this eponym.

*Paratype*. PANAMA. **Panamá**: El Llano–Cartí Highway, 10–12 km N of El Llano, 12 Sep. 1974, *R. Dressler 4749* (MO).

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Literature Cited

Burger, W. & C. M. Taylor. 1993. Rubiaceae. *In:* Flora Costaricensis. Fieldiana, Bot. 33: 306–307.

Dwyer, J. D. 1980. Rubiaceae. *In:* Flora of Panama. Ann. Missouri Bot. Gard. 67: 483–485.

Hooker, J. D. 1873. Rubiaceae. *In:* G. Bentham & J. D. Hooker, Genera Plantarum 2: 7–151.

Klotzsch, J. F. 1846. *In:* F. G. Hayne, Getreue Darstellung und Beschreibung der in der Arzneykunde Gebraüchlichen Gewächse. 14: 14–15. Nicolai, Berlin.

Robbrecht, E. 1988. Tropical Woody Rubiaceae. Opera Bot. Belgica 1: 1–271.

Simpson, R. D. 1976. Studies in neotropical Rubiaceae. *Rustia*. Phytologia 33: 4–8.

# New Orchid Species from Costa Rica

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ABSTRACT. Five new orchid species from Costa Rica are described and illustrated from living or liquid-preserved material: *Encyclia ortizii*, *Malaxis monsviridis*, *M. talamancana*, *Sobralia dissimilis*, and *S. doremiliae*. The orthography of *Sobralia* "*corazoi*" is discussed, and *S. carazoi* is thought to be correct.

Costa Rica has a long tradition of resident naturalists and orchidophiles collecting and pressing plants for study. The orchid flora of Costa Rica is thus much better sampled than those of neighboring countries. Even so, the preparation of the orchid treatment for *Manual de la Flora de Costa Rica* continues to reveal unnamed species, especially among terrestrials and smaller-flowered epiphytes. Five of these are here named and described.

**Encyclia ortizii** Dressler, sp. nov. TYPE: Costa Rica. Prov. Alajuela: Reserva San Ramón, aprox. 30 km NNO de San Ramón, 8, 9 dic. 1984, *R. L. Dressler y Biología 350 no. 288* (holotype, USJ). Figure 1.

Pseudobulbi pyriforme-ovoidei unifoliati; folia oblanceolato-oblonga; sepala oblongo-oblanceolata acuta; petala anguste oblanceolata; labello unguiculato trilobato lobi laterales parvi oblongi lobo intermedio subquadrato-ovato callo alto trigono carinato ornato.

Epiphytic, caespitose; pseudobulbs unifoliate, narrowly pyriform-ovate, somewhat flattened, 3.7 × 0.8–1.2 cm; leaves oblanceolate-oblong, narrowed basally, obtuse to subacute, 8.2–10 × 2.3–2.6 cm; inflorescence racemose, 12–24 cm, bracts deltoid, acute, 3–4 × 1.8–2 mm; pedicel with ovary 10–12 mm; sepals oblong-oblanceolate, acute, 9 × 2.8–3 mm; petals narrowly oblanceolate, 8 × 2 mm; lip unguiculate, claw ca. 4 mm, basally adnate to column, blade 3-lobed, lateral lobes oblong, porrect, clasping column apex, 2 × 1.3 mm; midlobe at right angle to column, ovate, 4 × 3.8 mm, callus prominent, trigonous, 1.5 × 1.5 mm, with laminar keel ca. 1.3 mm high; column ca. 7 mm, dorsal profile concave, midtooth ovate-elliptic, 1.7 × 0.8 mm, surpassing anther and lateral teeth, lateral teeth deltoid, 0.8 × 0.6 mm.

*Encyclia ortizii* is a member of subgenus *Osmophyta* and is closely allied to *E. campylostalix* (Reichenbach f.) Schlechter, *E. fortunae* Dressler, and *E. glauca* (Knowles & Westcott) Dressler & Pollard. The relatively slender column resembles that of *E. campylostalix*, while the sharply defined, rounded lateral lobes of the lip resemble those of *E. glauca* and *E. fortunae*. It is quite distinctive in the high, keeled callus and the orientation of the lip. The epithet honors Rodolfo Ortiz, director of the San Ramón nature reserve, in whose company the type material was collected.

**Malaxis monsviridis** Dressler, sp. nov. TYPE: Costa Rica. Puntarenas: Monteverde Reserve, near Alajuela boundary, Cerros Centinelas, elev. 1550–1600 m, 10°18′N, 84°47′W, 19 Aug. 1984, *M. H. Grayum & P. Sleeper 3842* (holotype, MO). Figure 2A, B.

Herba perennis erecta; pseudobulbis epigaeis ovato-conicis; folia duo late ovata breviter acuminata; inflorescentia subumbellata; bracteae deltoideo-lanceolatae; sepala oblongo-ovata obtusa; petala filiformia; labello subquadrato profunde hastato apice subquadrato trilobulato profunde excavato.

Pseudobulbs above ground, 1.5–3 × 0.6–1.2 cm, approximate or up to 3.5 cm apart on rhizome. Leaves 2, petioles 5–6 cm, blades broadly ovate, short-acuminate, 5–7.5 × 3.2–5 cm. Inflorescence subumbellate, scape 10–15 cm, floral bracts deltoid-lanceolate, to 1.5 mm; pedicel with ovary 6.5–10 mm; sepals oblong-ovate, obtuse, dorsal sepal 3–3.5 × 1.3–1.6 mm, lateral sepals 2.7–3 × 2 mm; petals filiform, 2–3 mm; lip hastate, subquadrate, 2.5–3 × 2–2.6 mm, basal auricles subdeltoid, retrorse, prominent; cavities 2, about half length of blade, cavity apically projecting under blade of lip; apex of lip 3-lobulate, lobules subequal, lateral lobes rounded, midlobule rounded or deltoid; column about 1 mm long; color: pale green or lip brownish green. Flowering July through September.

*Malaxis monsviridis* may be recognized by the prominently hastate lip with short, deep cavities and wide, trilobulate apex. Both *M. carpinterae* (Schlechter) Ames and *M. hastilabia* (Reichenbach

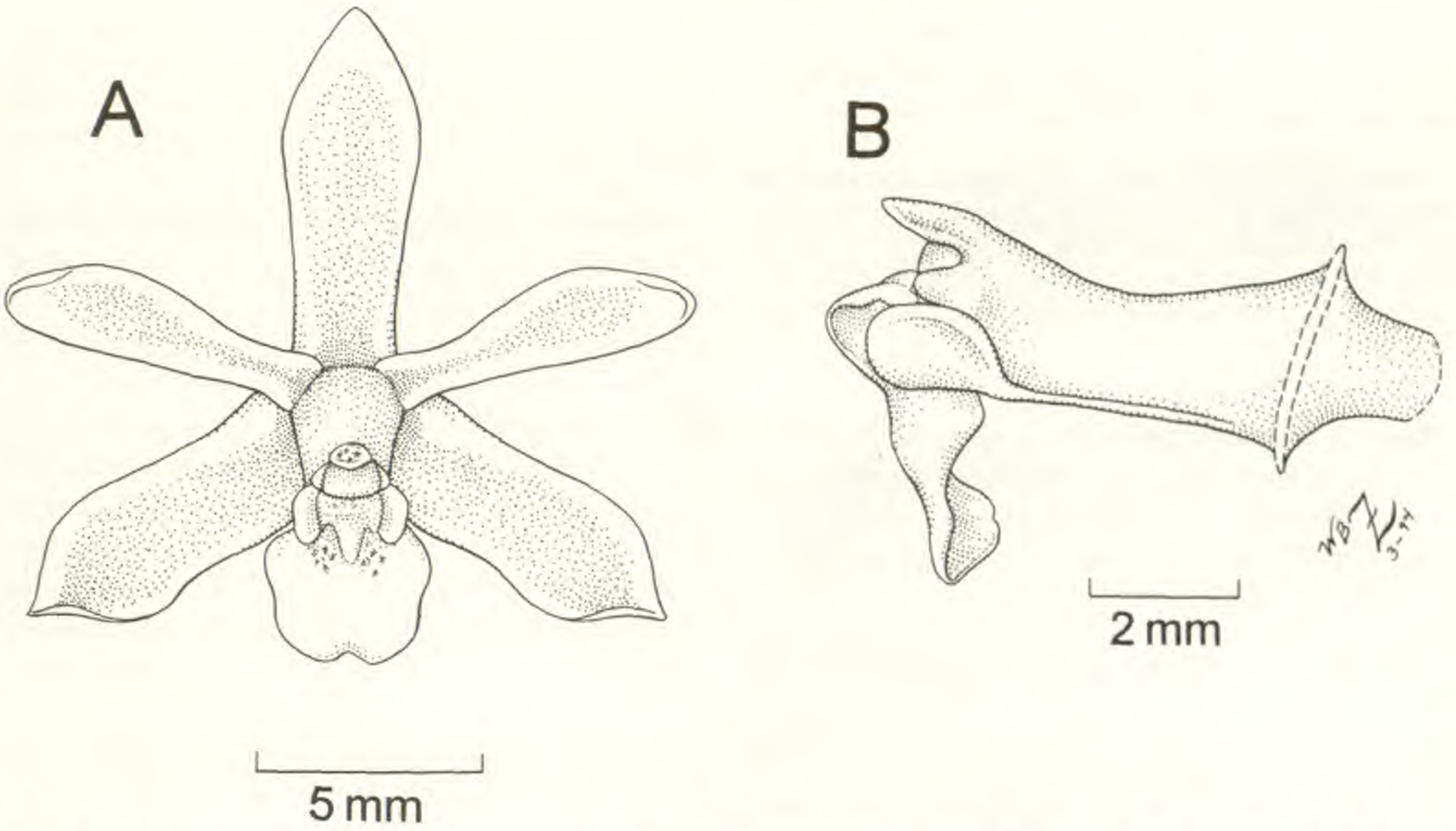


Figure 1. *Encyclia ortizii* Dressler (*Dressler y Biología 350* no. *288*). —A. Flower. —B. Column and lip, lateral view.

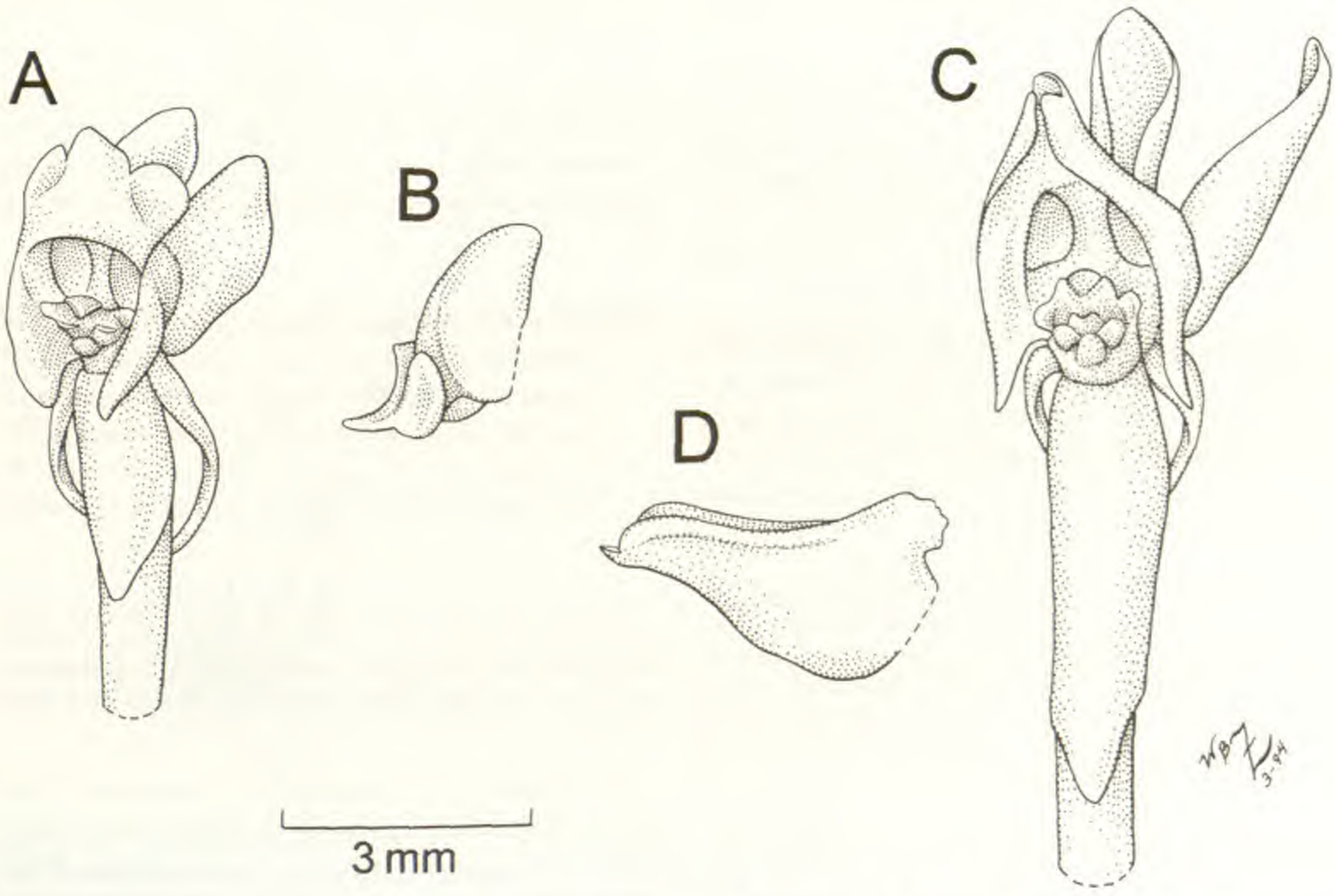


Figure 2. A, B. *Malaxis monsviridis* Dressler (A, B, *Atwood 89-319*). —A. Flower, dorsal view. —B. Lip, lateral view. C, D. *Malaxis talamancana* Dressler (C, D, *Dressler & Mora s.n.*). —C. Flower, dorsal view. —D. Lip, lateral view.

f.) Kuntze have lips with retrorse lobules and trilobulate apices, but the apices are much narrower and the cavity either narrower or longer.

*Paratypes.* COSTA RICA. **All from the area of Monteverde:** *J. T. Atwood 89-319* (SEL), *K. Barringer, E. Christenson & B. Pérez 4168* (F), *V. J. Dryer 699* (F), *W. A. Haber & E. Bello C. 2423* (MO), *W. Haber & W. Zuchowski 9315* (MO), *R. O. Lawton 1329* (F).

**Malaxis talamancana** Dressler, sp. nov. TYPE: Costa Rica. San José: Villa Mills, Cordillera de Talamanca, ca. 3000 m, 28 mar. 1993, *R. L. Dressler & D. E. Mora s.n.* (holotype, USJ). Figure 2C, D.

Herba perennis, erecta; pseudobulbis epigaeis, conicis; folia duo deltoideo-ovata cuneata vel subcordata breviter acuminata; inflorescentia subumbellata; bracteae deltoideo-lanceolateae; sepala ovata vel elliptica obtusa; petala sublinearia; labello deltoideo-ovato hastato ad apicem minute tridentato auricula retrorsa deltoidea vel denticulata.

Terrestrial, pseudobulbs above ground, conic, 2–4.5 × 0.8–2 cm, to 2.5 cm apart on rhizome. Leaves 2, petioles 5–7 cm; blades deltoid-ovate, cuneate to subcordate, apices short-acuminate, 5.5–8 × 3–4.2 cm. Inflorescence subumbellate, scape 15–20 cm, bracts deltoid-lanceolate, ca. 2 × 1 mm, ovary with pedicel 17–21 mm; sepals ovate to elliptic, narrowly obtuse, 3–6 × 1.5–2.3 mm; petals sublinear, 3–4 × 0.6 mm; lip 3–5 × 2–2.5 mm (in natural position), hastate, deltoid-ovate, apex minutely 3-dentate, lateral lobules folded upward, auricles retrorse, rounded, deltoid or denticulate, 0.8–1 × 0.8 mm; basal cavity deep, 1.5–2 mm, with rounded median keel, distal margin emergent.

*Malaxis talamancana* may be recognized by the deltoid-ovate, hastate lip minutely 3-dentate apically. Superficially, the flowers are similar to those of *M. brachyrrhynchos* (Reichenbach f.) Ames, but that species has subterranean corms and the details of the lip are quite distinct.

*Paratypes.* COSTA RICA. **San José:** trail from Canaán to Cerro Chirripó, between 2000 and 3000 m elev., 20 & 25 Aug. 1971, *W. C. Burger & L. Gómez P. 8358* (F). **Limón:** Cordillera de Talamanca, Atlantic slope, between Río Terbí and the Río Siní, elev. 2400–2750 m, 13 Sep. 1984, *G. Davidse, G. Herrera Ch. & M. H. Grayum 29048* (MO).

**Sobralia dissimilis** Dressler, sp. nov. TYPE: Costa Rica. Puntarenas: Monteverde Reserve, TV towers at 1750 m elev., 26 June 1989, *J. T. Atwood 89-243* (holotype, MO; isotypes, CR, FLAS, SEL). Figure 3.

Herba epiphytica; folia elliptica; flores e bracteis erectis imbricantibus nonullis erumpentis; sepala ovato-oblonga obtusa mucronata; petala ovato-oblonga; labellum ovatum margine fortiter undulatum; discus carinis biformis undecim ornatus.

Epiphytic, caespitose, stems stout, 35–75 cm; sheaths glabrous, verruculose. Leaves several, elliptic, acuminate, 13–15 × 4.5–5.2 cm, thin, not markedly corrugated. Inflorescence bract cluster ellipsoid, 5–6 cm, loose, glabrous, with 2 flowers at once; sepals ovate-oblong, obtuse, mucronate, 3.1–3.3 × 1.4 cm, lateral sepals basally connate for 6–7 mm; petals oblong-ovate, 3.1 × 1.3 cm; lip ovate, about 3 × 2.3 cm, tube about 1 cm, then flaring, exposing column, with 2 fleshy calli about 8 mm from base, with 11 keels from near center, outer 6 keels high, curved, not undulate, outermost short, next intermediate, then reaching to within 5 mm of apex, inner 5 keels strongly undulate, reaching 2–5 mm from apex; column 2.5 cm, basally slender, column wings narrowly deltoid, 4.5 × 3 mm, antrorse.

The epithet *dissimilis*, or different, refers both to the fact that the species is strikingly distinct from all others and to the two different types of keel on the lip. *Sobralia dissimilis* is clearly a close ally of *S. undatocarinata* C. Schweinfurth, of which there is an excellent photograph in *Orquídea* 5: 209, 1975 (as *S. mucronata* Ames & C. Schweinfurth; Horich, 1975). *Sobralia dissimilis* is quite distinct in the shorter, rounded limb of the lip (not pandurate or deeply bifid), in the wider, antrorse column wings, and in the two sharply different types of keel on the lip.

**Sobralia doremiliae** Dressler, sp. nov. TYPE: Costa Rica. Cartago: slopes and steep roadside banks along the Río Grande de Orosi about 11 km SSE of bridge at Tapantí, elev. about 1500 m, 10 July 1977, *R. L. Wilbur, F. Almeda & T. Daniel 22470* (holotype, DUKE). Figure 4.

Herba epiphytica; folia elliptica; flores e bracteis brevissimis nonnullis erumpente; sepala oblanceolata mucronata; petala oblongo-elliptica obtusa; labellum subquadrato-obovatum retusum; discus basi carinis humilis quindecim ornatus.

Epiphytic or on steep slopes, caespitose, stems 10–25 cm; sheaths glabrous or slightly verruculose and scurfy. Leaves elliptic or ovate-elliptic, short-acuminate, 4.5–9.5 × 1.7–3.4 cm. Inflorescence subtended by short, wide, divergent bracts, the floral bracts wide, retuse, scarcely emergent from the inflorescence bracts; flowers subcampanulate, white

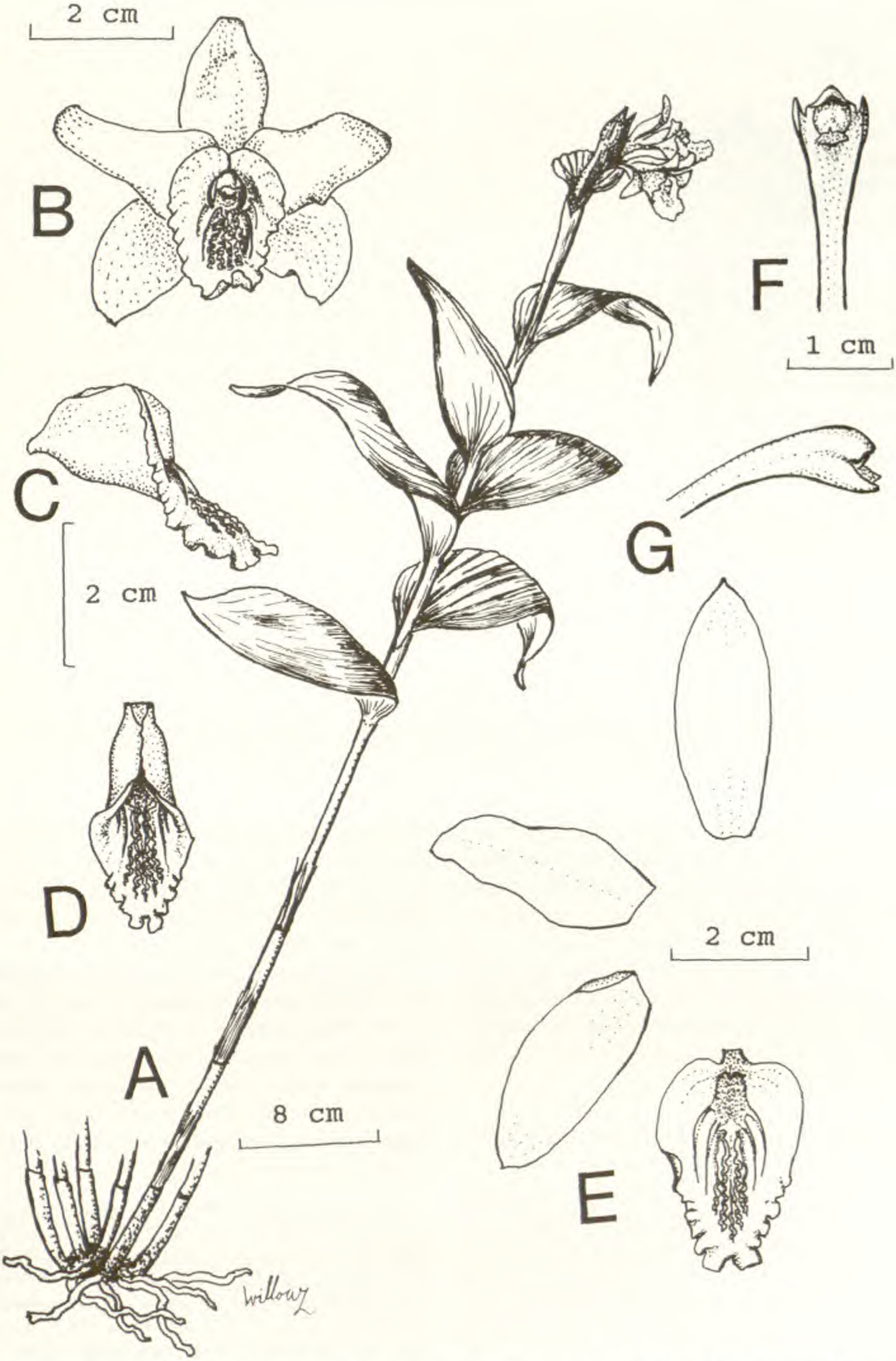


Figure 3. *Sobralia dissimilis* Dressler (*Atwood 89-243*). —A. Habit. —B. Flower. —C. Lip, lateral view. —D. Lip, natural position. —E. Perianth, flattened. —F. Column, ventral view. —G. Column, lateral view.

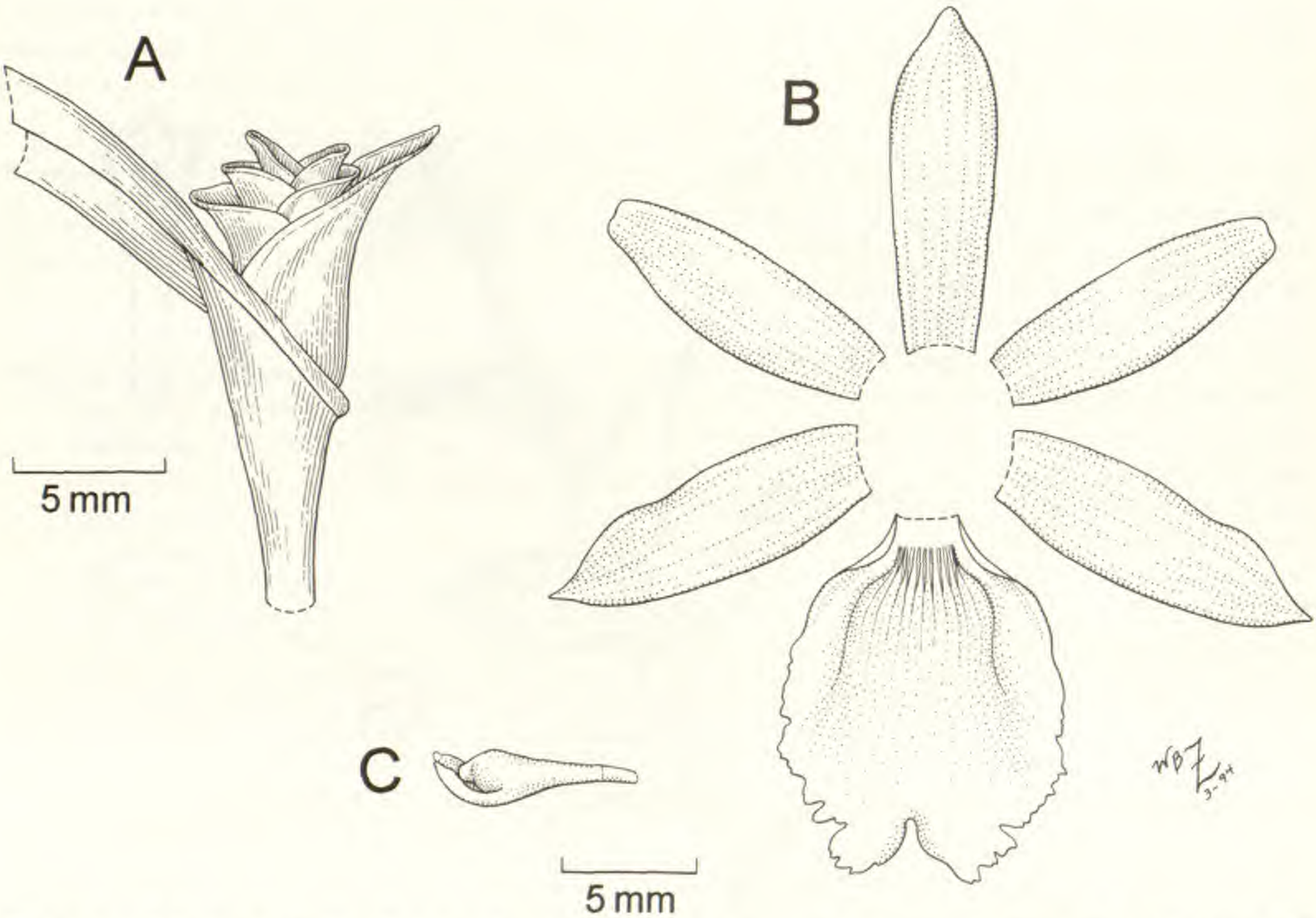


Figure 4. *Sobralia doremiliae* Dressler (*Dressler & Mora s.n.*). —A. Inflorescence, showing short bracts. —B. Perianth, flattened. —C. Column.

or pale green, base of lip orange or orange-brown; sepals united for 3 mm, oblanceolate or elliptic-oblanceolate, mucronate, 17–20 × 5–6 mm; petals oblong-elliptic, obtuse, 16–18 × 4–5 mm; lip basally cuneate, subquadrate-obovate, retuse, 17–18 × 11–12 mm, margins lacerate-dentate above middle, base with about 15 keels, most shorter than column, central 4 subequal to column; column 8–9 mm, wings falcate, surpassing anther; capsule 4.5–5 × 0.8–1.1 mm.

The epithet *doremiliae* honors Dora Emilia Mora de Retana, director of the Lankester Garden, with whom we collected and photographed this species near the type locality. The specimen chosen as type includes much more flowering material than our own scanty material (at USJ). I have purposely omitted the "a" of Dora to avoid a seeming diphthong that could lead to mispronunciation (the alternative being hyphenation).

*Sobralia doremiliae* ranges at least from the San Ramón area of Costa Rica to Cerro Colorado in Panama. It may be recognized by the small, subcampanulate flower and the form of the inflorescence. It somewhat resembles *S. carazoi* Lankester & Ames (see note below); *Smith 1109* is a mixture of these species. *Sobralia doremiliae*, however, is smaller in all parts, and the ornamentation of the lip is quite different, as are the bracts of the inflorescence. The floral bracts of *S. carazoi* are elliptic and densely scurfy.

The inflorescence of *S. doremiliae* resembles that of *S. lindleyana* Reichenbach f. and *S. macrophylla* Reichenbach f. in that the sheaths of the inflorescence bracts and the uppermost leaves are markedly infundibuliform, the bracts, themselves, are short and wide, and the floral bracts are quite short, remain green, and do not project as an ellipsoid bract cluster (Fig. 4A).

*Paratypes.* COSTA RICA. **Alajuela:** Los Angeles de San Ramón, 21 VII 1932, *A. M. Brenes 16124* (F), 2 VIII 1932, *A. M. Brenes 16246* (F); La Peña de Zarcero, alt. 1450 m, 22 Aug. 1938, *A. Smith 1109* (AMES, SEL). **Cartago:** weedy roadsides and steep heavily vegetated banks along the ICE road 9 km NW of the Tapantí Dam or 9 km SE of the Tapantí Bridge across the Río Grande de Orosi, alt. ca. 1300 m, *R. L. Wilbur 30765* (DUKE). **San José:** La Hondura de San José, alt. 1300–1700 m, 16, 19 Mar. 1924, *P. C. Standley 37718* (AMES), alt. 1300 m, 15 agosto 1933, *M. Valerio 798* (F). PANAMA. **Chiriquí:** Cerro Colorado, ca. 50 km N of San Félix, elev. ca. 1400 m, 17 Aug. 1975, *R. L. Dressler 5092* (FLAS), elev. 1400–1500 m, 20 Sep. 1977, *R. L. Dressler 5708* (FLAS, PMA).

ORTHOGRAPHY OF *SOBRALIA CARAZOI*

*Sobralia corazoi* was published by Lankester and Ames (Ames, 1924). The surname Corazo, if such exists, is not common in Costa Rica, but Carazo is well known. Rafael Lucas Rodríguez investigated this in some detail (letter to L. A. Garay, 22 Dec. 1978, Microfiche of Ames Herbarium, Inter Documentation Co.) and found that the person honored by the epithet was Enrique Carazo Quezada, concluding that the spelling "*corazoi*" was an error. That the error had been recognized at the Ames Orchid Herbarium is suggested by specimens clearly labeled as "*carazoi*" by Schweinfurth in 1938.

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Literature Cited

Ames, O. 1924. Additions to the orchid flora of tropical America. Sched. Orch. 7: 1–36.

Horich, C. K. 1975. Las sobralias, encanto lindo pero fugaz. Orquídea 5: 204–212.

# Two New Species of *Paspalum* (Poaceae: Paniceae) from Brazil

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ABSTRACT. Two narrow endemics, *Paspalum campinarum* (group *Corcovadensia*) from Amazonas, Brazil, and *P. zuloagae* (group *Quadrifaria*) from Minas Gerais, Brazil, are described, illustrated, and compared with putatively related species. *Paspalum zuloagae* is easily distinguished from all members of the *Quadrifaria* group by its prominent sheath auricles, and *P. campinarum* is distinguished from South American species of the *Corcovadensia* group by its upper glume ⅗–⅘ as long as the upper floret and the possession of axillary inflorescences.

While studying Poaceae collections from Brazil, some specimens of *Paspalum* L. were encountered that could not be assigned to any species in that genus and are described here as new. *Paspalum* is a largely American genus of approximately 330 species. As the largest grass genus in Brazil, many of its species are ecological dominants of savannas and grasslands. The monograph by Chase (1929) of North American species, and her unpublished work of the South American species [accessible from the Hitchcock and Chase Library in the Botany Department of the Smithsonian Institution], are essential references for studies in the genus. Chase proposed a largely informal infrageneric classification in these two works, and it has been extensively used by many contemporary agrostologists.

**Paspalum campinarum** Filgueiras & Davidse, sp. nov. TYPE: Brazil. Amazonas: Transamazon Highway, 53 km W of Aripuanã River, "campina" region, common but not abundant in open campina of white sandy soil, 29 June 1979, *C. E. Calderón, O. P. Monteiro & J. Guedes 2715* (holotype, INPA; isotypes, MO, US). Figure 1.

Ab omnibus speciebus austroamericanis *Corcovadensiae* inflorescentia terminali ac axillari, gluma superiore ⅗–⅘ longitudinis spiculae differt.

Caespitose perennials; rhizomes short, knotty. Culms 40–75 cm long, erect to semi-decumbent at the base, branched just above the lowest nodes but occasionally also with flowering branches from the middle or upper nodes, with 6–8 elongate internodes; basal internodes pilose, the upper ones glabrous; basal nodes pilose to glabrescent, the upper ones glabrous. Leaves cauline only; basal bladeless sheaths densely pilose, the upper ones glabrescent to glabrous, striate, one margin long ciliate, the other glabrous; auricles usually 2, 0.5–1.5 mm long, developed primarily on the upper sheaths; ligule 0.2–0.3 mm long, membranous, glabrous; blades 4–9.9 cm long, 9–19 mm wide, lanceolate, slightly cordate at the base, glabrous on both surfaces, strongly striate, especially on the adaxial surface, the margins scabrous, usually ciliate at the base and pubescent near the margins of the very short pseudopetiole with tuberculate, white hairs 2–5 mm long. Inflorescences 10.5–13 cm long when fully exserted, terminal and axillary, with 5–25 ascending racemes in terminal inflorescences, fewer in axillary inflorescences; common rachis 9–12 cm long, glabrous; racemes 1.5–6.5 cm long, terminating in a spikelet; raceme rachis 0.3–0.6 mm wide, triquetrous, with a few scattered, tuberculate, white hairs 4–8 mm long. Pedicels 0.5–1 mm long, of unequal length, paired, the apex discoidal. Spikelets 2.3–2.9 mm long, 1–1.2 mm wide, elliptical in outline, paired, pubescent, tan-brown; lower glume absent; upper glume ⅗–⅘ as long as the spikelet, 3-nerved, the surface appressed pilose, the margins densely ciliate; lower floret sterile, consisting only of a lower lemma; lower lemma as long as the spikelet, 3-nerved, the surface glabrous, the margins ciliate; lower palea absent; upper floret bisexual, minutely longitudinally striate, pale, glabrous; upper lemma 5-nerved, glabrous, minutely longitudinally striate, the germination flap evident at the base; upper palea similar to the upper lemma in size and texture, 2-nerved, minutely longitudinally striate; lodicules 2, conduplicate; stamens 3, the anthers 2–2.2 mm long, tan to brownish; ovary 0.3–0.4 mm long; styles 2, separate; stigmas 2, plumose, tan. Caryopsis not found.

In the following differentiating characters—perennial life form, relatively broad leaf blades, pan-

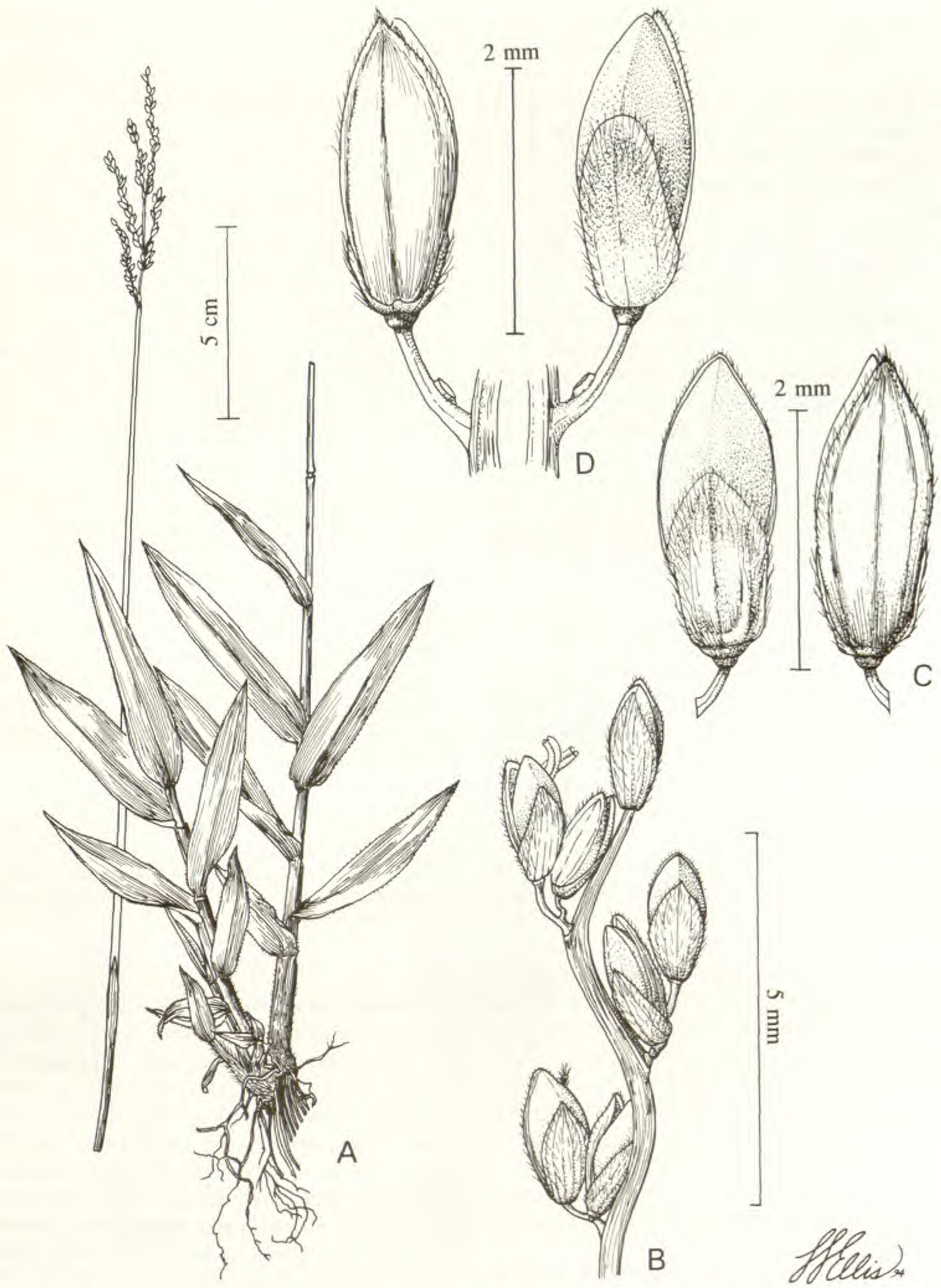


Figure 1. *Paspalum campinarum* Filgueiras & Davidse, illustrated from the type collection (*Calderón et al 2715*). —A. Habit. —B. Terminal portion of a raceme. —C. Dorsal (left) and ventral (right) views of a secondary spikelet. —D. Dorsal (left) and ventral (left) views of a primary spikelet.

icles with several to many racemes, a narrow rachis, paired, undifferentiated plano-convex spikelets, pale upper florets, and minutely longitudinally striate texture of the upper floret—*P. campinarum* agrees with those of group *Corcovadensia*, of which three other species occur in Brazil: *P. corcovadense* Raddi, *P. loefgrenii* Ekman, and *P. mandiocanum* Trinius. It is also worth noting that in both *P. corcovadense* and *P. mandiocanum* the upper glume is distinctly shorter than the spikelet, but not nearly as short as in *P. campinarum*. We, therefore, believe that its true affinity is with this species group.

We also compared *Paspalum campinarum* to *P. inaequivalve* Raddi because the latter is a perennial species with relatively short, broad leaf blades, terminal and axillary panicles with several to many racemes, a narrow rachis, paired, undifferentiated spikelets, pale upper florets, and, especially, a shortened upper glume that exposes the upper floret. Chase (unpublished) included two species in the group *Inaequivalvia*: *Paspalum inaequivalve* Raddi and *P. microstachyum* J. S. Presl. The latter is an annual with long-pedicellate, irregularly arranged spikelets with the upper glume as long as the lower lemma, and is clearly not closely related to *P. campinarum* or *P. inaequivalve*. *Paspalum inaequivalve* differs from *P. campinarum* in its weak, trailing to decumbent culms, glabrous, noncordate basal leaves, 3 to 15 racemes with glabrous rachis and, especially, a smooth, shining upper floret that is not minutely longitudinally striate.

It is perhaps unwise to differentiate species groups in *Paspalum* primarily on the basis of relative length of the upper glume, since reduction of the upper glume seems to have evolved repeatedly in obviously different groups of *Paspalum*, for example: *P. inaequivalve* (group *Inaequivalvia*), *P. usteri* Hackel [sect. *Anachrysis* (Nees) Pilger], *P. marmoratum* Kuhlmann (group *Plicatula*), *P. delicatum* Swallen (group *Parviflora*), and *P. decumbens* Swartz (group *Decumbentes*). Reduction has been carried to the extreme in species without any upper glume, as in: *P. gardnerianum* Nees (sect. *Eremachyrion* Doell, group *Gardneriana*), *P. nudatum* Luces (group *Parviflora*), and *P. pulchellum* Kunth (group *Reimaria*).

*Paspalum campinarum* is known only from a single collection from the white sandy "campina" in the Brazilian Amazonia, where it was found to be "common but not abundant." The specific epithet alludes to this campinas habitat. It is notable that this is the same locality in which a highly distinctive grass genus, *Arundoclaytonia* Davidse & Ellis, was discovered at the same time (Davidse & Ellis, 1987). We assume that like *A. dissimilis* Davidse & Ellis, *Paspalum campinarum* is probably restricted to the white-sand soils of Amazonian campinas.

The four Brazilian species of the *Corcovadensia* group may be distinguished as follows:

1a. Panicle rachis 15–25 cm long; spikelets 2.5–2.9 mm long; upper glume as long as the spikelet; lower glume frequently present .. *P. loefgrenii*
1b. Panicle rachis usually less than 15 cm long; spikelets 1.8–2.5 mm long; upper glume shorter than the upper floret; lower glume always absent.
  2a. Upper glume $\frac{9}{10}$–$\frac{8}{10}$ as long as the upper floret ..... *P. campinarum*
  2b. Upper glume $\frac{9}{10}$ as long as the upper floret.
    3a. Spikelets 1.4–1.5 mm wide, elliptic-oblanceolate; racemes relatively thick; culms frequently decumbent at the base and rooting at the lower nodes ..... *P. mandiocanum*
    3b. Spikelets 0.9–1.0 mm wide, broadly elliptical; racemes relatively slender; culms generally erect and not rooting at the lower nodes ..... *P. corcovadense*

**Paspalum zuloagae** Davidse & Filgueiras, sp. nov. TYPE: Brazil. Minas Gerais: Serra da Gramma, summit, mossy rock, 19–25 Apr. 1925, *A. Chase 9578* (holotype, US; isotype, MO). Figure 2.

Ab omnibus speciebus *Quadrifariae* auriculis conspicuis, 5–13 cm longis (auriculae ligulae saepe connatae) differt. *Paspalo coryphaeo* Trinius simile sed rhizomatibus nullis, laminis 5–17 cm longis, basin versus attenuatis, inflorescentia 8–17 cm longa, 12–27 racemis differt.

Perennial, caespitose; rhizomes weakly developed or absent. Culms 65–90 cm long, erect, frequently branched at the base, sometimes with aggregate branches from the middle nodes; nodes glabrous; internodes glabrous. Leaves mostly basal, but old culms without basal leaves; basal leaves with imbricate sheaths; sheaths strongly striate, glabrous on the back, often purplish, the margins long-ciliate; auricles 2, 5–13 mm long, conspicuous, glabrous to sparsely long-pilose; ligule 4–11 cm long, membranous, mostly adnate with the auricles, but distinguishable by its membranous texture; ligular area glabrous, rarely with a few yellowish hairs 1–2 mm long; blades 5–17 cm long, 6–12 mm wide, linear-lanceolate, attenuate at the base, acuminate at the apex, glaucous, glabrous on both surfaces or with a few scattered, whitish hairs on the adaxial surface, the margins prominently ciliate with tuberculate-based, whitish or slightly yellowish hairs 3–5 mm

Figure 2. *Paspalum zuloagae* Davidse & Filgueiras, illustrated from the type collection (*Chase 9578*). —A. Habit. —B. Ligular area of a leaf. —C. Portion of a raceme with paired spikelets. —D. Dorsal (left) and ventral (right) views of secondary spikelet. —E. Dorsal (left) and ventral (right) views of a primary spikelet.

long, the cilia less frequent in the uppermost leaves; epidermal cells visible on the abaxial surface of blades, especially on the older leaves. Inflorescence 8–17 cm long, terminal, with 12–27 ascending racemes; common rachis 6.5–14 cm long, glabrous; racemes 2–12 cm long, with a tuft of whitish or slightly yellowish hairs at the base, decreasing in size toward the apex, terminating in a spikelet; ra-

ceme rachis ca. 0.2 mm wide, glabrous. Pedicels 0.3–1 mm long, of unequal length, paired, glabrous, waxy, the apex discoidal. Spikelets 2–2.5 mm long, 0.8–1 mm wide, narrowly elliptic in outline, paired, glabrescent to puberulent, tan to yellowish; lower glume absent; upper glume ⅔–¾ as long as the spikelet, 3-nerved, glabrescent to puberulent; lower floret sterile, consisting only of a lower lemma; lower lemma as long as the spikelet, 3-nerved, glabrous to puberulent; lower palea absent; upper floret bisexual, smooth, pale, glabrous; upper lemma 5-nerved, glabrous, longitudinally striate; upper palea similar to the upper lemma in texture and color, 2-nerved, longitudinally striate; lodicules 2, conduplicate; stamens 3, the anthers 1–1.5 mm long, deep purple; ovary 0.4–0.5 mm long; styles 2, separate; stigmas 2, plumose, purplish. Caryopsis not found.

This new species belongs to the informal *Quadrifaria* group of Chase by virtue of its perennial life form, terminal panicles with numerous racemes, narrow raceme rachis, small, paired, undifferentiated, tan to green, elliptical spikelets, and pale upper floret. *Paspalum zuloagae* is distinguishable from all the other species of group *Quadrifaria* by the presence of two conspicuous auricles on either side of the sheath apex. The auricles are mostly herbaceous in texture with well-developed veins that are continuous with those of the sheath. This grades into a membranous apex near the tip of the auricle. In fully developed leaves from the middle nodes of the culms, the auricles are almost completely adnate with the equally long membranous ligule. In basal leaves and leaves from the upper nodes, the auricle may be considerably larger than the ligule and the upper half of the auricle is therefore free. Both auricles and ligule are typically greatly reduced in the flag leaf. The delicate connection between the ligule and auricle is readily torn so that the ligule and auricles often seem superficially separate in older leaves.

The spikelets are slightly dimorphic in that the upper glume is shorter in the secondary or short-pedicellate spikelets compared to those of the primary or long-pedicellate spikelets.

The specific epithet honors Fernando O. Zuloaga, prominent Argentinean agrostologist, long-time friend, and valued collaborator of both authors. The collections *Chase 9562* and *9578* were cited in the index to Chase's unpublished South American manuscript as the basis for the establishment of a new species, "*Paspalum auritum* C., ined." However, no description was provided and no annotation on the labels was made.

*Paratypes*. BRAZIL. **Minas Gerais**: Serra da Gramma, open summit, 19–25 Apr. 1925, *A. Chase 9562* (MO, US 2 sheets); Serra do Espinhaço, ca. 20 km E of Diamantina, elev. 900 m, cerrado, culms to ca. 1.5 m tall, 22 Mar. 1970, *H. S. Irwin, S. F. da Fonséca, R. Souza, R. Reis dos Santos & J. Ramos 28072* (UB).

The following key is provided to distinguish all the species that we include in group *Quadrifaria*:

1a. Leaf sheaths with 2 conspicuous auricles 5–13 mm long ..... *P. zuloagae*
1b. Leaf sheaths without auricles or, if present, inconspicuous and 2 mm long or less.
  2a. Raceme rachis with ciliate hairs 1–3 mm long; cauline leaf blades with the basal ¼–½ strongly narrowed, folded, and pseudopetiolate.
    3a. Leaf blades 4–8 mm wide ..... *P. quadrifarium*
    3b. Leaf blades 12–15 mm wide ..... *P. brunneum*
  2b. Raceme rachis glabrous or scaberulous, long hairs restricted to the base and axils of the racemes, rarely the rachis shortly pubescent; cauline leaf blades rounded to narrowed but not pseudopetiolate.
    4a. Basal nodes, internodes, and leaf sheaths densely villous; sheaths strongly keeled; spikelets glabrous .. ..... *P. dasytrichium*
    4b. Basal nodes, internodes, and leaf sheaths glabrous to pilose, but never densely villous; sheaths slightly keeled to weakly rounded; spikelets pubescent ..... *P. coryphaeum*

*Paspalum brunneum* Mez, Repert. Spec. Nov. Regni Veg. 15: 74. 1917. TYPE: Brazil. Guanabara: *Glaziou 9050* (lectotype, designated by Smith et al. (1982), US).

*Distribution:* Argentina, Brazil, Paraguay, Uruguay.

*Paspalum coryphaeum* Trinius, Gram. Panic. 114. 1826. TYPE: Brazil. In humidis prope Ytu, *Langsdorff s.n.* (holotype, LE not seen).

*Paspalum chapadense* Swallen, Phytologia 14: 363. 1967. TYPE: Brazil. Maranhão: collected in chapada between Caxias and Barro do Corda, 18–26 Feb. 1934, *Swallen 3508* (holotype, US; isotype, K not seen).

*Paspalum familiare* Steudel, Syn. Pl. Glumac. 1: 24. 1853. TYPE: Venezuela. Sucre: *Funck & Schlim 228* (holotype, P?, fragments, US).

*Paspalum indutum* Luces, J. Wash. Acad. Sci. 32: 162, f. 6. 1942. Syn. nov. TYPE: Venezuela. Mérida: Pozo Hondo, near Egido, 960 m, Apr. 1940, *Sergent 37* (holotype, VEN, fragments, MO, US).

*Paspalum pruinosum* Trinius, Sp. Gram. 3: t. 272. 1836. TYPE: Brazil. Pr. Cachoeira, *Anon. s.n.* (LE not seen).

*Paspalum violascens* Mez, Repert. Spec. Nov. Regni Veg. 15: 73. 1917. TYPE: Trinidad: in loco accuratione haud indicata, *Broadway 2175* (holotype, B?, fragment, US; isotype, US).

*Distribution:* Argentina, Belize, Brazil, Colombia, Costa Rica, Guianas, Honduras, Mexico, Panama, Trinidad, Venezuela.

*Paspalum dasytrichium* Dusén ex Swallen, Phytologia 14: 363. 1967. TYPE: Brazil. Paraná: Villa Velha, collected among rocks, 21 Oct. 1914, *Dusén 15700* (holotype, US).

*Paspalum dasytrichium* var. *dasytrichium*.

*Paspalum dasytrichium* var. *glabrum* Lyman B. Smith & D. C. Wasshausen, Bradea 2: 247. 1978. TYPE: Brazil. Santa Catarina: Mun. Lajes, moist ground in shade, woods borders, Coxilha Rica, 6 Jan. 1946, *Swallen 8173* (holotype, US).

*Distribution:* Brazil (Paraná, Santa Catarina, São Paulo).

*Paspalum quadrifarium* Lamarck, Tabl. Encycl. 1: 176. 1791. TYPE: Argentina. Buenos Aires, *Commerson s.n.* (lectotype, designated by Parodi (1937), P not seen).

*Paspalum ferrugineum* Trinius, Sp. Gram. 2: 136. 1829. TYPE: Chile, *Lindley s.n.* (syntype, LE not seen). Uruguay, *Otto s.n.* (syntype, fragment, US).

*Paspalum quadrifarium* var. *ferrugineum* (Trinius) Herter, Anales Mus. Hist. Nat. Montevideo, ser. 2, 3: 55. 1929.

*Distribution:* Argentina, Brazil, Paraguay, Uruguay.

*Paspalum zuloagae* Davidse & Filgueiras.

*Distribution:* Brazil (Minas Gerais).

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Literature Cited

Chase, A. 1929. The North American species of *Paspalum*. Contr. U.S. Natl. Herb. 28(1): i–viii, 1–310, ix–xvii.

Davidse, G. & R. P. Ellis. 1987. *Arundoclaytonia*, a new genus of the Steyermarkochloeae: Arundinoideae from Brazil. Ann. Missouri Bot. Gard. 74: 479–490.

Parodi, L. 1937. Contribución al estudio de las gramineas del genero "Paspalum." Revista Mus. La Plate, n.s., Bot. 1: 211–251.

Smith, L. B., D. C. Wasshausen & R. M. Klein. 1982. Gramíneas. *In* R. Reitz (editor), Flora Ilustrada Catarinense. Herbário "Barbosa Rodrigues," Itajaí.

# The Genus *Polycarpon* (Caryophyllaceae) in South America, with One New Species from the Norte Chico of Chile

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ABSTRACT. *Polycarpon coquimbense* Gereau & Marticorena (Caryophyllaceae) is described from central Chile, a key to and a brief conspectus of the South American species of *Polycarpon* are provided, and *P. australis* Britton is reduced to synonymy under *P. suffruticosum* Grisebach.

RESUMEN. Se presentan la descripción de *Polycarpon coquimbense* Gereau & Marticorena (Caryophyllaceae) proveniente de Chile central, una clave y una sinopsis de las especies sudamericanas de *Polycarpon*; y *P. australis* Britton está ubicado en la sinonimia de *P. suffruticosum* Grisebach.

*Polycarpon* Loefling ex L. (Caryophyllaceae, Paronychioideae, Polycarpeae; Pax & Hoffmann, 1934) is a genus of some 16 species of warm and warm-temperate regions of the world (Pedersen, 1987). The following combination of characters distinguishes *Polycarpon* from the other genera of Caryophyllaceae in South America (Reiche, 1896; Macbride, 1937; Añón, 1967; Pedersen, 1984, 1987): stipules present, interpetiolar, connate (though sometimes deciduous and detectable only as an interfoliar rim); flowers in cymes; sepals free or connate only at extreme base, usually keeled, rarely cucullate to subcucullate; petals present, entire to emarginate; style undivided at least in lower half; stigma 3-lobed to 3-parted; fruit a several-seeded capsule; and seeds not winged.

Macbride (1937) mistakenly treated *Drymaria engleriana* (Muschler) Baehni & J. F. Macbride as *Polycarpon englerianum* Muschler (Duke, 1961); *P. urbanianum* Muschler is here considered a probable synonym of *Drymaria engleriana*. Examination of an isotype of *Polycarpon australis* Britton (*Morong 933*, MO) has shown it to be synonymous with *P. suffruticosum* Grisebach. With these exclusions, four species of *Polycarpon* are known from South America. Three of these species are native, including the one newly described here. The four species may be distinguished as follows:

KEY TO THE SPECIES OF *POLYCARPON* IN SOUTH AMERICA

1a. Root slender, delicate; base of stem herbaceous.
  2a. Stems with a line of pubescence on one side of apical internodes; leaves opposite or in verticils of 5–10, the blades linear to oblanceolate; sepals not winged on keel .. ..... 1. *P. apurense*
  2b. Stems glabrous; leaves opposite or in verticils of 3 or 4, the blades elliptic to obovate; sepals winged on keel ..... ..... 3. *P. tetraphyllum*
1b. Root thick, fleshy or woody; base of stem a woody caudex.
  3a. Leaves strictly opposite, the blades broadly obovate to orbicular, 5–9 mm long, obtuse to rounded at base; cymes dense; sepals 1-nerved, keeled; stamens 5; capsule ca. 1.6 mm long; seeds 3–7 .. 4. *P. coquimbense*
  3b. Leaves opposite or verticillate, the blades spatulate to oblong- or linear-lanceolate, 10–40 mm long, attenuate at base; cymes lax; sepals 3-nerved, subcucullate; stamens 3; capsule ca. 5 mm long; seeds 25–35 ..... 2. *P. suffruticosum*

ENUMERATION OF THE SOUTH AMERICAN SPECIES

1. *Polycarpon apurense* Kunth in Humb., Bonpl. & Kunth, Nov. Gen. Sp. 6: 40. 1823.

Synonymy in Pedersen (1987).

ARGENTINA (**Corrientes**) and URUGUAY (Pedersen, 1987). BRAZIL. **Goiás:** *Irwin et al. 17682* (MO, NY). **Mato Grosso:** *Harley & Souza 11101* (K, MO). **Pará:** *Berg & Henderson 649* (MO, NY). **São Paulo:** *Eiten & Campos 3473* (MO). VENEZUELA. **Amazonas:** *Carnevali et al. 1503* (MO, VEN). **Apure:** *Davidse & González 12877* (MO).

2. *Polycarpon suffruticosum* Grisebach, Abh. Königl. Ges. Wiss. Göttingen 19: 29. 1874.

*Polycarpon australis* Britton, Ann. New York Acad. Sci. 7: 53. 1892 [sub "*Polycarpa*"]. Syn. nov. TYPE: Paraguay. Pilcomayo River, 1888–1890, *Morong 933* (holotype, NY not seen; isotype, MO).

Further synonymy in Pedersen (1987).

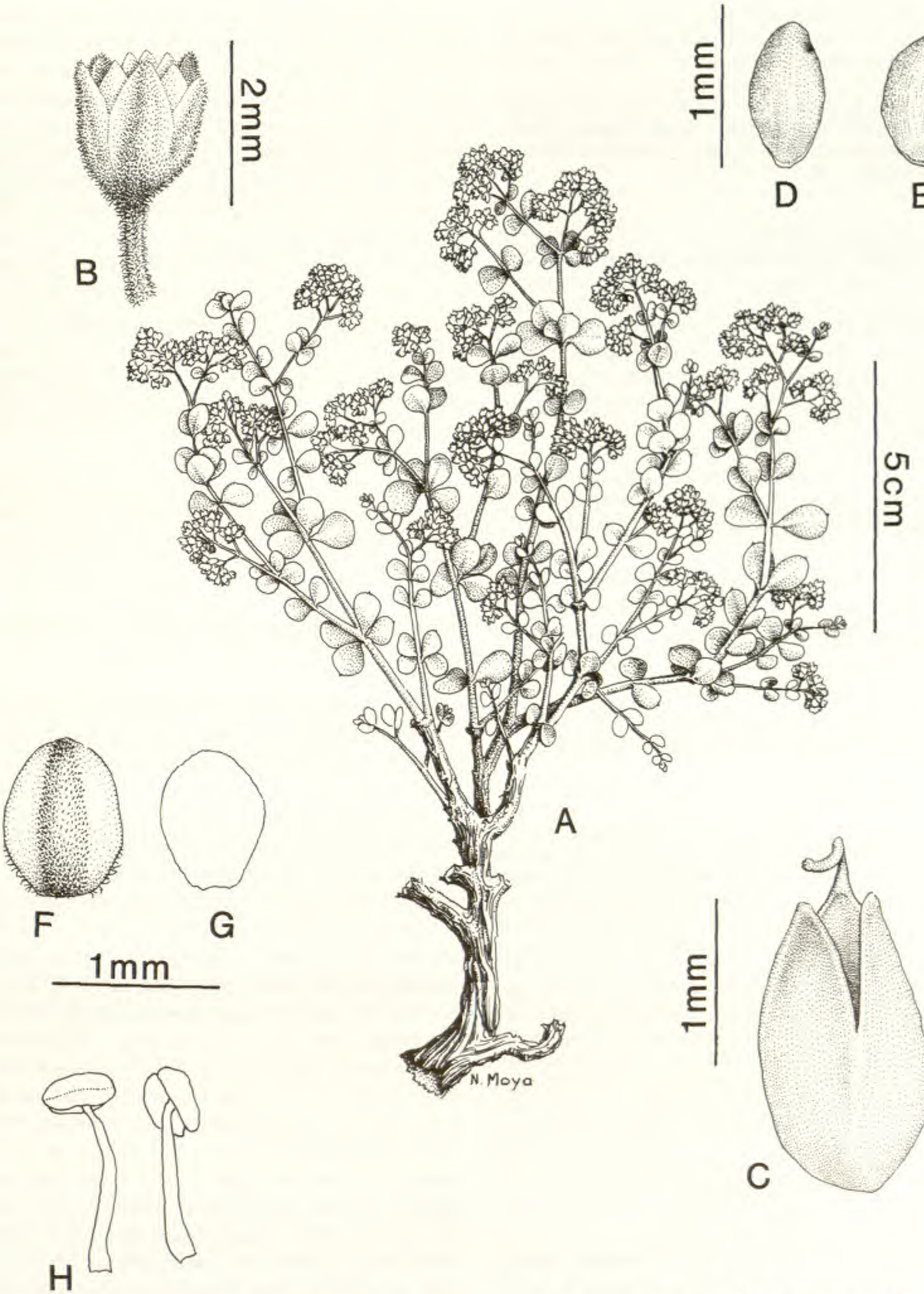


Figure 1. *Polycarpon coquimbense* Gereau & Marticorena. —A. Flowering plant. —B. Open flower. —C. Dehiscing capsule. —D. Seed, dorsal view. —E. Seed, lateral view. —F. Sepal, dorsal view. —G. Petal, dorsal view. —H. Stamens, lateral and ventral views. Illustrations based on: A–G, *Ricardi et al. 1135*; H, *Ricardi et al. 1802*.

ARGENTINA. **Buenos Aires:** Añón (1967). **Córdoba, Jujuy, Tucumán, Santa Fe:** Martínez-Crovetto (1967). **Entre Ríos:** Pedersen (1987). **Chaco:** *Jorgensen 2366* (MO). **Corrientes:** *Krapovickas et al. 27409* (CTES, MO). **Formosa:** *Morel 4593* (LIL, MO). **Salta:** *Rosa 264* (MO). PARAGUAY. **Gran Chaco:** *Hassler 2481* (MO). **Presidente Hayes:** *Schinini & Palacios 25831* (CTES, MO).

3. *Polycarpon tetraphyllum* (L.) L., Syst. Nat. ed. 10. 881. 1759. *Mollugo tetraphylla* L., Sp. Pl. 1: 89. 1753.

Native to the Mediterranean region of Eurasia and North Africa; introduced in southern Brazil, Uruguay, coastal Argentina (Pedersen, 1984), and central provinces of Chile (Reiche, 1896). Also collected in:

CHILE. **Juan Fernández Islands:** *Meyer 9373* (MO, NA). PERU. **Lima:** *Valencia & Cano 1718* (MO). VENEZUELA. **Distrito Federal:** *Croat 21820* (MO).

**4. Polycarpon coquimbense** Gereau & Marticorena, sp. nov. TYPE: Chile. Prov. Coquimbo: Dpto. Elqui, Camino Internacional a San Juan [Argentina], Puente Las Terneras, 22 km al interior de Guanta, 1650 m, 29°59′S, 70°14′W, 7.I.1967, *Ricardi, Marticorena & Matthei 1802* (holotype, CONC; isotype, OS). Figure 1.

Fruticulus humilis, ramis basalibus lignosis tortis, ramulis floriferis sublignosis, usque ad 15 cm longis. Folia opposita; stipulis caducis (nobis non observatis), sed foliorum basibus crista stipulari manifeste unitis; petiolis 0.4–1.0 mm longis, crassiusculis; laminis 5–9 mm longis × 4–9 mm latis, late obovatis ad orbiculatis, apice rotundatis, basim versus obtusis ad rotundatis, coriaceis, nervo unico longitudinali vix manifesto. Cymae densae, terminales, dichotomae; bracteis scariosis ovatis 0.6–0.9 mm longis. Flores subsessiles; sepalis 5, 1.9–2.4 mm longis, ovato-orbiculatis, obtusis, uninervibus, nervo viridibus carinatisque; petalis perigynis, 1.3–1.5 mm longis, oblongis, obtusis, integris; staminibus 5, perigynis, filamentis 1.0–1.1 mm longis, antheris ca. 0.5 mm longis; ovario trigono-ovoideo ca. 0.8 mm longo × 1.0 mm lato, stylo ca. 0.7 mm longo, indiviso, stigmatibus 3 liberis. Capsula trigono-ovoidea ca. 1.6 mm longa × 1.1 mm lata; seminibus 3–7, 0.90–1.05 mm longis × 0.35–0.40 mm latis, erectis, lunato-fusiformibus, superficie lucente, fere laevi (minute celluloso-papillosa).

Shrublet, very low, the basal branches woody, twisted, the flowering branchlets subligneous, to 15 cm long, yellowish to olive-green, longitudinally sulcate, glabrous to minutely pulverulent with very short fasciculate trichomes. Leaves opposite, sometimes with an axillary pair of smaller leaves; stipules caducous (none observed), but leaf bases conspicuously united by a stipular ridge; petioles 0.4–1.0 mm long, rather stout, adaxially canaliculate; blades 5–9 × 4–9 mm, broadly obovate to orbicular, rounded at apex, obtuse to rounded at base, with a single, inconspicuous longitudinal nerve, tomentulose above and beneath when young with branched fasciculate trichomes. Cymes dense, terminal, dichotomous, 4–6-branched, the basal internodes 4–10 mm long, the upper very short; bracts scarious, ovate, 0.6–0.9 mm long; branches tomentulose as in young leaves. Flowers subsessile; sepals 5, 1.9–2.4 mm long, ovate-orbicular, obtuse, 1-nerved, green and keeled on nerve, broadly hyaline on margins, united for ca. 0.5 mm at base and forming an hypogynous disk, tomentulose externally as in branches of cyme; petals perigynous, 1.3–1.5 mm long, oblong, obtuse, entire; stamens 5, perigynous, the filaments 1.0–1.1 mm long, the anthers ca. 0.5 mm long; ovary trigonous-ovoid, ca. 0.8 mm × 1.0 mm, unilocular, with 9 ovules inserted at base of central column; style ca. 0.7 mm long, contiguous with column of ovary, undivided, with 3 free stigmas. Capsule trigonous-ovoid, ca. 1.6 × 1.1 mm; seeds 3–7, 0.90–1.05 × 0.35–0.40 mm, erect, lunate-fusiform; embryo dorsal, curved, brown; perisperm ventral, yellowish brown; seed surface shining, nearly smooth (minutely cellular-papillose).

*Polycarpon coquimbense* resembles *P. suffruticosum* in its habit; the differences are noted in the key above. In this respect it also resembles *P. polycarpoides* (Bivona-Bernardi) Zodda ex Jahandiez & Maire subsp. *herniarioides* (Ball) Maire & Weiller of dry montane habitats in northwestern Africa and the southeastern Iberian Peninsula (Amich & Pedrol, 1990), and *P. sauvagei* Mathez of the Central Plateau of Morocco (Mathez, 1983). *Polycarpon sauvagei* is readily distinguished by its sessile, narrowly elliptic leaves measuring only 2.2–5.0 × 0.5–1.5 mm and its large flowers (sepals 3.5–4.0 mm long, petals ca. 3.5 mm long). *Polycarpon polycarpoides* subsp. *herniarioides* is superficially quite similar to *P. coquimbense*, but the former taxon may be distinguished by the following characters: leaf blades 3–7 × 1–2.5 mm, oval to obovate, acute at apex; sepals 1.5–2.0 mm long, only slightly cucullate (not keeled); seeds 0.6–0.8 mm long, nearly white. [Note: Amich & Pedrol (1990) mistakenly ascribed the combination *Polycarpon polycarpoides* to Fiori (Nuovo Giorn. Bot. Ital., nov. ser. 15: 347. 1908), who specifically rejected the name as "una logomachia senza senso comune." Maire (1963) cited its authorship as Zodda ex Fiori (Nuov. Fl. Italia 1: 451. 1923), but Fiori there used *polycarpoides* only as an unranked infraspecific epithet under *P. peploides* DC. Jahandiez & Maire (Cat. Pl. Maroc 2: 212. 1932) validly transferred the specific epithet from *Hagaea polycarpoides*

Bivona-Bernardi to *Polycarpon*, crediting Zodda with the combination. The correct author citation is therefore *P. polycarpoides* (Bivona-Bernardi) Zodda ex Jahandiez & Maire.]

*Paratypes*. CHILE. **Prov. Coquimbo:** Guanta, entre Rivadavia y Guanta, 1215 m, 29°50′S, 70°25′W, 4.II.1963, *Ricardi, Marticorena & Matthei 677* (CONC, MO); camino de La Serena a Baños del Toro, 23 km al interior de Guanta, 1650 m, 29°59′S, 70°15′W, 27.X.1964, *Ricardi, Marticorena & Matthei 1135* (CONC, MO).

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Literature Cited

Amich, F. & J. Pedrol. 1990. *Polycarpon* Loefl. ex L. *In:* S. Castroviejo, M. Laínz, G. López González, P. Montserrat, F. Muñoz Garmendia, J. Paiva & L. Villar (editors), Flora Ibérica 2: 161–167. Real Jardín Botánico, Madrid.

Añón Suárez de Cullen, D. 1967. Caryophyllaceae. *In:* A. L. Cabrera (editor), Flora de la Provincia de Buenos Aires 3: 192–237. Instituto Nacional de Tecnología Agropecuaria, Buenos Aires.

Duke, J. A. 1961. Preliminary revision of the genus *Drymaria*. Ann. Missouri Bot. Gard. 48: 173–268.

Macbride, J. F. 1937. Caryophyllaceae. *In:* J. F. Macbride, Flora of Peru, Field Mus. Nat. Hist., Bot. Ser. 13(2): 578–638.

Maire, R. 1963. Caryophyllaceae. *In:* R. Maire, Flore de l'Afrique du Nord 9: 5–300, Editions Paul Lechevalier, Paris.

Martínez-Crovetto, R. 1967. Catálogo preliminar de las Caryophyllaceae de la Argentina y del Uruguay. Bonplandia (Corrientes) 2: 187–264.

Mathez, J. 1983. Une espèce nouvelle du genre *Polycarpon:* (Caryophyllaceae): *P. sauvagei*. Bull. Soc. Bot. France 130, Lett. Bot.: 357–362.

Pax, F. & K. Hoffmann. 1934. Caryophyllaceae. Nat. Pflanzenfam. ed. 2, 16c: 275–364.

Pedersen, T. M. 1984. Caryophyllaceae. *In:* M. N. Correa (editor), Flora Patagónica 4a: 196–276. Instituto Nacional de Tecnología Agropecuaria, Buenos Aires.

———. 1987. Caryophyllaceae, Cariofiláceas. *In:* N. Troncoso de Burkart & N. M. Bacigalupo (editors), Flora Ilustrada de Entre Ríos (Argentina) 3: 251–291. Instituto Nacional de Tecnología Agropecuaria, Buenos Aires.

Reiche, C. 1896. Cariofiláceas. *In:* C. Reiche, Flora de Chile 1: 173–212. Imprenta Cervantes, Santiago.

# New Species of the Southern African Genus *Geissorhiza* (Iridaceae: Ixioideae)

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ABSTRACT. Three new species are recognized in the southern African *Geissorhiza*, a genus now including 84 species. *Geissorhiza silenoides* and *G. rupicola* are members of subgenus *Geissorhiza* and occur in the Ceres District of the southwestern Cape, South Africa. Both have pale pink flowers with unusually long perianth tubes for the genus. *Geissorhiza silenoides* is additionally distinguished by having unequal stamens, each filament being of a different length, scabrid-puberulent stems, and leaves with heavily thickened margins and midribs. *Geissorhiza rupicola* has unusual soft-textured corm tunics and, like *G. silenoides*, has leaves with strongly thickened margins and midribs. The third new species, *G. uliginosa*, is restricted to the Swartberg Mountains of the southern Cape and grows on wet cliffs and under waterfalls. It stands out in the genus in having the flowers solitary on the stems, and very soft-textured corm tunics that rapidly decay, sometimes leaving the corms apparently without tunics. All three new species occur in the southern and southwestern part of southern Africa, a region known for the richness and diversity of its flora, particularly of geophytes.

More than half of the estimated 1750–1800 species of the petaloid monocot family, Iridaceae, occur in southern Africa (Goldblatt, 1994). The region is well known botanically, yet despite over 250 years of botanical exploration, novelties continue to be discovered there. Although the family is a numerically significant element of the flora of a large part of southern Africa, Iridaceae are most diverse in the southern and western coastal belt and adjacent mountains of the subcontinent, a region of mediterranean-type climate with winter rainfall and summer drought. Three new species of *Geissorhiza*, a genus virtually restricted to the winter rainfall zone of southern Africa, are described here. Some 81 species were admitted to the genus when it was last revised (Goldblatt, 1985), and the new species described here thus bring the total to 84. *Geissorhiza* is a member of Iridaceae subfamily Ixioideae, the largest of the four subfamilies currently recognized in Iridaceae (Goldblatt, 1990, 1991). It is one of the largest genera of the subfamily and one of the larger genera in the southern African flora. One of the new species, *G. uliginosa*, belongs in subgenus *Weihea*, which is characterized by concentric corm tunics, and *G. silenoides* and *G. rupicola* are members of subgenus *Geissorhiza*, species of which have the characteristic imbricate corm tunics that inspired the generic name, a Greek word meaning tiled root.

**1. Geissorhiza silenoides** Goldblatt & J. C. Manning, sp. nov. TYPE: South Africa. Western Cape: Ceres District, lower slopes of Gydo Pass, 20 Sep. 1993, *Goldblatt & Manning 9739* (holotype, NBG; isotypes, K, MO, PRE, WAG). Figure 1A.

Plantae 20–30 cm altae, cormo 5–7 mm diametro tunicis duris imbricatis, foliis linearibus 1.2–1.5 mm latis marginibus costisque incrassatis, spica 4–7 florum, floribus pallide roseis, tubo perianthii cylindrico 15–17 mm longis, tepalis subaequalibus 12.5–14 × 6–7 mm, filamentis inaequalibus 4, 7 et 9 mm longis, antheris ca. 4.5 mm longis, stylo eccentrico.

Plants 20–30 cm high. *Corm* ± ovoid, 5–7 mm diam., flattened slightly below on one side, the tunics woody, blackish, imbricate, the layers breaking below into triangular points. *Cataphylls* membranous, the upper light purple above the ground. *Leaves* 4, the lower 2 basal and longest, reaching to at least the middle of the stem, sometimes to the base of the spike, straight and erect or trailing, the blades linear, 1.2–1.5 mm wide, oval in section with 2 narrow grooves on each surface, the midrib much thickened, the margins raised and arched over the surface, the upper leaves cauline, sheathing for at least half their length, the blades like the basal, the uppermost sometimes only 9–12 mm long and en-

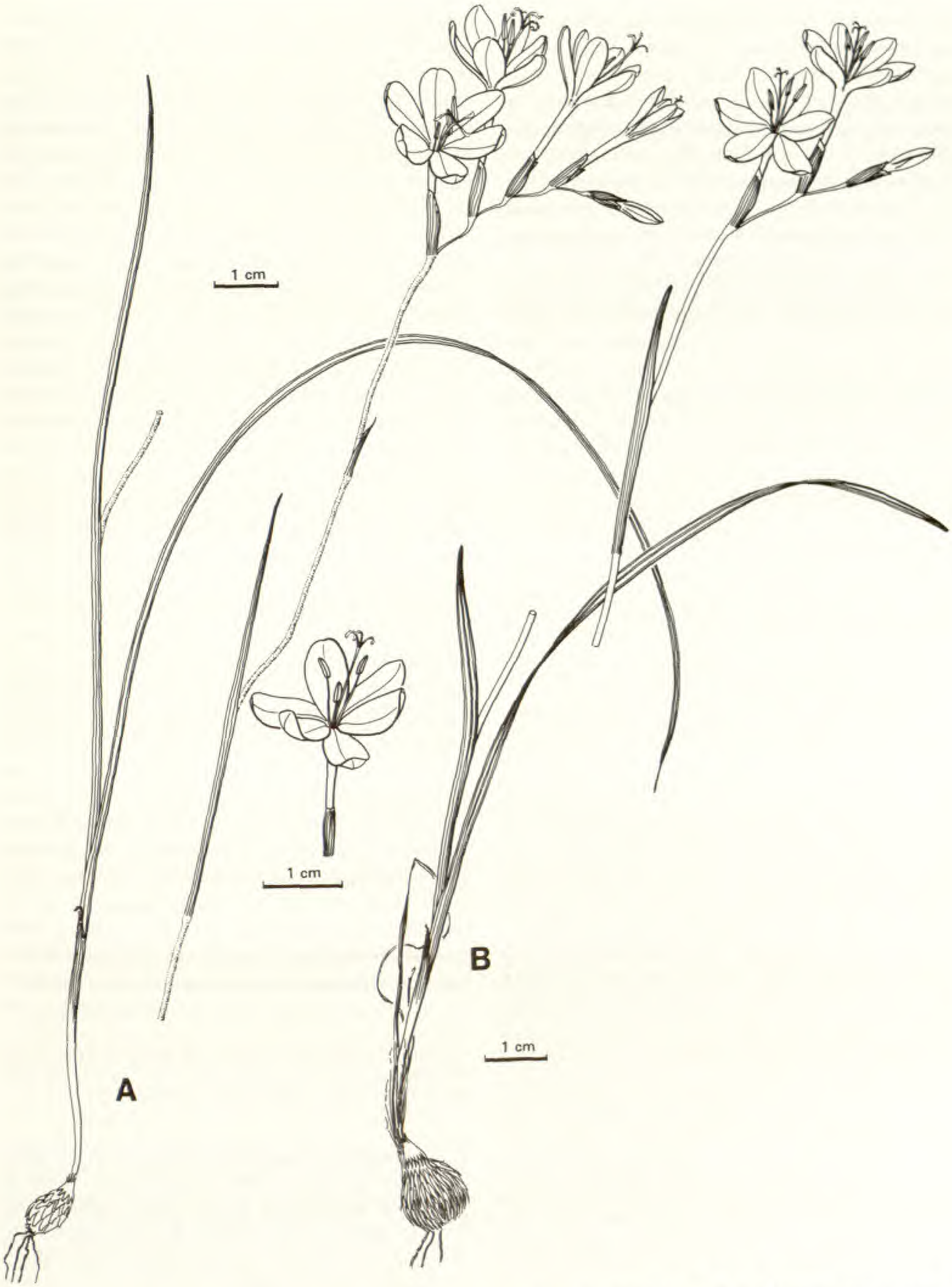


Figure 1. Whole plants and floral details of (A) *Geissorhiza silenoides* Goldblatt & J. C. Manning (*Goldblatt & Manning 9739*) and (B) *G. rupicola* Goldblatt & J. C. Manning (*Esterhuysen 36197*). Drawn by John Manning.

tirely sheathing. *Stem* erect below, flexed above the sheaths of the 2 upper leaves and inclined above, unbranched, minutely scabrid-puberulent. *Spike* flexuose, drooping in bud, 4–7-flowered; *bracts* unequal, the outer pale green, the upper margins pinkish purple, 7–10 mm long, the inner about two-thirds as long, transparent with 2 green keels. *Flowers* hypocrateriform, actinomorphic, pale pink, darker toward the tepal margins, the center becoming whitish, unscented; *perianth tube* cylindric, 15–17 mm long; *tepals* subequal, obovate, 12.5–14 × 6–7 mm, when fully open spreading at right angles to the tube. *Filaments* unequal, inserted ca. 2 mm below the apex of the tube, 4, 7, and 9 mm long, straight and erect; *anthers* ca. 4.5 mm long, cream, the pollen pale yellow. *Ovary* ovoid, ca. 2 mm long; *style* exceeding the anthers by 2–4 mm, the branches unusually long, 5–6 mm long, recurving. *Capsules* and *seeds* unknown.

Flowering September to mid October.

*Etymology*. The species is named for the resemblance of the flowers to those of some southern African species of *Silene* (Caryophyllaceae), a species of which grows near *Geissorhiza silenoides* and has flowers of nearly the same pink color.

*Distribution and habitat*. *Geissorhiza silenoides* is evidently restricted to the Ceres District of Western Cape Province, South Africa, an area that is relatively well explored botanically. Only two collections of the species are known, suggesting that it is rare and extremely local in distribution. The type collection was made along a roadside cutting on the south-facing lower mountain slopes of Gydo Pass, and the other collection, made in 1924, is without precise location. The slopes of Gydo Pass have a relatively high rainfall and soils of heavy clay derived from shales of the Bokkeveld Shale Series. These slopes are normally densely clothed with fynbos vegetation dominated by the arborescent *Protea laurifolia* Thunberg, and a dense ground cover and little open ground where geophytes can grow. Geophytes are, however, fairly common and diverse there and appear in profusion after fire or clearing of the bush, such as along the road verges, where there were extensive populations of *G. silenoides* growing together with *Hesperantha bachmannii* Baker, also Iridaceae. We suspect that *G. silenoides* may occur elsewhere in similar habitats along the lower mountain slopes of the ranges north and east of Ceres, where the same vegetation and soils occur. After fire, the slopes adjacent to Gydo Pass should be explored for additional populations of *G. silenoides*.

The blackish imbricate corm tunics regularly notched below into blunt triangular segments place *Geissorhiza silenoides* in subgenus *Geissorhiza*, one of two subgenera recognized by Goldblatt (1985). Within the subgenus, this species stands out in the scabrid-puberulent stems, short leaves with heavily thickened margins and midribs, thus with two narrow grooves on each surface, and in the flowers. The pale pink perianth color is unusual in subgenus *Geissorhiza*, although it is known in a few species of sections *Geissorhiza* and *Monticola*. The most distinctive floral features of *G. silenoides* are the long perianth tube combined with the unequal stamens, each filament being of a different length. Unequal filaments occur sporadically in subgenus *Geissorhiza*, although typically only one filament is short and the remaining two are equal. The combination of long tube and unequal stamens is known only in section *Monticola*, but most members of this section have soft-textured corm tunics and only one, *G. scopulosa* Goldblatt, has puberulous stems (Goldblatt, 1985). In section *Geissorhiza* unequal filaments also occur in some species, and although hard-textured corm tunics and leaves with thickened margins and midribs are typical of this section, a long perianth tube is not. Sectional placement of *G. silenoides* is somewhat uncertain, but we tentatively suggest that *G. silenoides* has its closest relatives among the species of section *Monticola*. Because of its unusual combination of derived features, its immediate relatives are uncertain.

*Geissorhiza silenoides* is undoubtedly *Geissorhiza* sp. 1 (Goldblatt, 1985), listed as such because of the inadequate material known at the time. The single sheet, collected by F. A. Rogers in 1924, comprises two specimens that are rather poorly pressed. Nevertheless, the scabrid-puberulent stems, leaves with thickened margins and midribs, and flowers with long perianth tubes are clearly evident.

*Paratype*. SOUTH AFRICA. **Western Cape:** 3319 (Worcester) "Ceres," (possibly the town itself or the district) (?AD), Sep. 1924, *Rogers 28746* (Z).

**2. Geissorhiza rupicola** Goldblatt & J. C. Manning, sp. nov. TYPE: South Africa. Western Cape: Mosterthoek Twins, Green Gullies Kloof, ca. 1250 m, 9 Dec. 1984, *Esterhuysen 36197* (holotype, BOL; isotypes, MO, NBG, PRE, WAG). Figure 1B.

Plantae (10–)15–20 cm altae, cormo 9–12 mm diametro tunicis mollibus, foliis (2–)3 linearibus 1.5–3 mm latis marginibus costisque forte incrassatis, spica (1–)2–6 florum, floribus pallide roseis, tubo perianthii cylindricis (16–)19–23 mm longis, tepalis subaequalibus 12–15 × 4.5–5.5 mm, filamentis ca. 8 mm longis aequalibus, antheris ca. 3.5 mm longis, stylo eccentrico.

Plants (10–)15–20 cm high. *Corm* 9–12 mm diam., globose, the tunics initially unbroken, soft and papery, becoming torn into narrow vertical strips, ultimately almost fibrous. *Cataphylls* usually dry and brown at flowering time, usually persisting and accumulating around the stem base as a neck of dry brittle fibers. *Leaves* (2–)3, the lower one or two basal, the lowermost longest, reaching to between the upper third of the stem and the base of the spike, the second of the basal leaves usually much shorter, and sheathing in the lower half, the blades linear, 1.5–3 mm wide, the margins and midribs heavily thickened and raised into wings overarching the laminar surfaces, uppermost leaf inserted on the mid to upper part of the stem, smaller than the basal, sheathing for at least half its length, sometimes entirely. *Stem* ascending or drooping from cracks in steep rock faces, smooth, unbranched. *Spike* (1–)2–6-flowered, flexuose; *bracts* subequal, the outer pale green entirely or purple toward the apices, 8–11 mm long, the inner membranous narrower than the outer, two keeled, forked in the upper 1–2 mm. *Flowers* pale pink, actinomorphic, unscented; *perianth tube* cylindric, (16–)19–23 mm long; *tepals* subequal, ovoid-oblong, spreading at right angles to the tube, 12–15 × 4.5–5.5 mm. *Filaments* ca. 8 mm long, exserted ca. 6 mm from the tube; *anthers* ca. 3.5 mm long, cream, the pollen yellow. *Ovary* oblong, 2–3 mm long; *style* eccentric, dividing at or beyond the anther apices, ultimately exceeding the anthers by ca. 4 mm, the branches ca. 2 mm long. *Capsules* globose, 4–6 mm long; *seeds* prismatic, the angles ridged, brown, ca. 1.5 mm at the longest axis.

Flowering late November to early December.

*Etymology*. From the Latin "rupicola," favoring rocky habitats.

*Distribution and habitat*. *Geissorhiza rupicola* is known only from moist shady sites on Mosterthoek Twins, a mountain at the western end of the Langeberg Mountains, in the Ceres District of Western Cape Province, South Africa. Plants are confined to moist sites, where they grow in thin soil on rocks, sometimes in cracks in steep cliffs. Such habitats are uncommon as late in the year as November and December in the summer dry Western Cape. *Geissorhiza rupicola* joins a small number of species of this genus, mostly of section *Monticola*, that favor montane habitats and flower late in the season in sheltered sites. The species was discovered by the Cape botanist Elsie Esterhuysen, who has made an extraordinary contribution to the knowledge of the mountain flora of the southern and western Cape.

*Geissorhiza rupicola* stands out in the genus in its unusually long perianth tube, 2–2.5 times as long as the tepals and 16–22 mm long. A tube of this length is also known in *G. grandiflora* Goldblatt, but this species has longer tepals and unequal stamens, one filament of which is shorter than the other two. *Geissorhiza silenoides* also has an unusually long perianth tube but can immediately be distinguished from *G. rupicola* by its puberulous stem, hard imbricate corm tunics, and unequal stamens.

*Paratype*. SOUTH AFRICA. **Western Cape:** 3319 (Worcester) Mosterthoek Twins, Green Gullies Kloof, ca. 1250 m (4000 ft.) (AD), 18 Dec. 1988 (fr), *Goldblatt 7483* (BOL, MO, NBG).

**3. Geissorhiza uliginosa** Goldblatt & J. C. Manning, sp. nov. TYPE: South Africa. Western Cape: Oudtshoorn District, Swartberg Mountains, stream E of Gouekrans Hiking Trail hut (AC), 15 Jan. 1989, *Vlok 2075* (holotype, NBG; isotype, MO). Figure 2.

Plantae 15–30 cm altae, cormo reducto 3–5 mm diametro, foliis 5, laminibus planis marginibus costisque leviter incrassatis, floris solitariis, floribus roseis vel purpureis, tubo perianthii infundibuliformis 9–13 mm longis, tepalis subaequalibus 20–22 × 9–11 mm, filamentis 12–14 mm longis aequalibus, antheris 7–9 mm longis, stylo declinato.

Plants 15–30 cm high. *Corm* very reduced, 3–5 mm diam., the tunics light brown, soft-textured, not accumulating with age. *Cataphylls* rapidly decaying, membranous. *Leaves* usually at least 5, the lower 3 basal and longest, usually shorter than the stems but trailing, the blades plane with lightly thickened margins and midribs, the cauline leaves shorter than the basal, largely or entirely sheathing. *Stem* drooping, usually with at least one, sometimes up to four branches. *Spike* 1-flowered; *bracts* green, the margins often red, the outer 16–20 mm long, the inner about as long as or slightly shorter than the outer. *Flowers* funnel-shaped, actinomorphic, pale pink to purplish, cream in the throat, the base of the tepals dark pink, unscented; *perianth tube* narrowly funnel-shaped, 9–13 mm long; *tepals* ovate-oblong, subequal, 20–22 × 9–11 mm, subpatent when fully open. *Filaments* 12–14 mm long, equal in length, unilateral; *anthers* 7–9 mm long, dark brown, the pollen brownish. *Ovary* ovoid, 3–4 mm long; *style* declinate, extended below the filaments, the branches ca. 4 mm long. *Capsules* and *seeds* unknown.

Flowering December and January.

*Etymology*. Named for the moisture-loving conditions the species requires, "*uliginosa*," the Latin adjective describing such habitats.

*Distribution and habitat*. *Geissorhiza uliginosa*

Figure 2. Whole plant and floral details of *Geissorhiza uliginosa* Goldblatt & J. C. Manning (*Vlok 881* and *2075*). Drawn by John Manning.

is restricted to waterfalls and wet cliffs in the Swartberg Mountains of the southern part of Western Cape Province, South Africa. Plants are known from only a few localities in this semiarid area of low and predominantly winter rainfall. The species joins a handful of others in the genus that favor this specialized habitat, e.g., *G. cataractarum* Goldblatt, *G. elsiae* Goldblatt, and *G. outeniquensis* Goldblatt. The species was discovered by the South African botanist J. H. J. Vlok, who made the first two collections in the summer of 1984–1985.

Despite the similar habitats favored by *Geissorhiza uliginosa* and the species mentioned above, the relationships of *G. uliginosa* appear to lie not with any of these other moisture-loving, cliff-dwelling species, but with another species of the southern Western Cape, *G. fourcadei* (L. Bolus) G. Lewis. That species grows in thin soils on rock outcrops in the mountains of the southern Cape, and it flowers mainly in the autumn, February to May. Like *G. fourcadei*, *G. uliginosa* has pale pink flowers and branched stems, each of which bears just a single flower. *Geissorhiza uliginosa* differs in having flowers with a shorter perianth tube, 9–13 mm long, plane leaves, and soft-textured short-lived corm tunics. This contrasts with the longer perianth tube, (8–)17–20 mm long, xeromorphic terete, four-grooved leaves, persistent fibrous cataphylls, and larger corms with persistent firm-papery corm tunics of *G. fourcadei*.

*Paratypes*. SOUTH AFRICA. **Western Cape:** 3321 (Ladismith) Swartberg Mountains, along road to Gamkakloof at Waterfall Kloof (DC), 5 Dec. 1985, *Goldblatt 7455* (MO). 3322 (Oudtshoorn) upper N-facing slopes of Waboomsberg in perennial waterfall, ca. 4800 ft. (AC), 26 Dec. 1984, *Vlok 881* (MO, NBG); lower southern slopes of the Swartberg at Rust-en-Vrede, cliffs next to waterfall (AD), 20 Jan. 1985, *Vlok 894* (MO).

*Acknowledgments*. We thank Elsie Esterhuysen and Jan Vlok for assistance with fieldwork and for drawing our attention to *G. rupicola* and *G. uliginosa*, respectively.

Literature Cited

Goldblatt, P. 1985. Systematics of the southern African genus *Geissorhiza* (Iridaceae–Ixioideae). Ann. Missouri Bot. Gard. 72: 277–447.

———. 1990. Phylogeny and classification of Iridaceae. Ann. Missouri Bot. Gard. 77: 607–627.

———. 1991. An overview of the systematics, phylogeny and biology of the southern African Iridaceae. Contr. Bolus Herb. 13: 1–74.

———. 1994. Geography of African Iridaceae. Pp. 931–940 *in* J. H. Seyani & A. C. Chikuni (editors), Proceedings of the XIIIth plenary Meeting AETFAT, Malawi, Volume 2. National Herbarium and Botanic Gardens of Malawi, Zomba.

# *Nolina cismontana* (Nolinaceae), a New Species Name for an Old Taxon

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ABSTRACT. *Nolina parryi* subsp. *wolfii* is shown to be a synonym of *N. parryi* subsp. *parryi*. Consequently, *N. parryi* subsp. *parryi* sensu Munz has been misinterpreted and is without a name. *Nolina cismontana* is proposed as the name for this undescribed taxon.

It is necessary to publish a new name for *Nolina parryi* S. Watson sensu Munz before volume 11 of the *Flora of North America* is published. The junior author studied the California *Nolina* species complex for his M.S. thesis (Dice, 1988). He determined that the name *N. parryi* was assigned by western botanists to the wrong plants, and consequently these plants are unnamed.

Munz (in Munz & Roos, 1950) described *Nolina parryi* subsp. *wolfii* based on plants from the Kingston Range in the eastern Mojave Desert and the San Jacinto/Santa Rosa Mountains along the northwestern edge of the Colorado Desert. Plants fitting this description are now known to extend from the Kern Plateau in southern Tulare County south to the Laguna and Pinyon Mountains of San Diego County, California. The taxon is found in the drier parts of the Peninsular Ranges, along the western edge of the Colorado Desert and in the desert ranges of the Mojave Desert. This means that by this interpretation subspecies *parryi* occurs in the coastal drainages below 3000 feet from Ventura to San Diego counties and west of subspecies *wolfii*. There is no evidence that Munz ever examined the type of *N. parryi*. Dice examined the holotypes and isotypes of subspecies *parryi* and subspecies *wolfii*. The holotype of subspecies *parryi* and Watson's (1879) publication of its description indicate that *N. parryi* came from the desert east of San Bernardino and not from the coastal side of the mountains. The leaves on this holotype and isotype are wider than what Munz allows for his subspecies *parryi* and would key out in his keys to subspecies *wolfii*. Subspecies *wolfii* is a synonym for Watson's typical *N. parryi*, and the plants from the coastal drainages that Munz was calling subspecies *parryi* are without a name.

Dice (1988) showed that there are quantitative morphological traits such as leaf number per rosette, stem length, leaf width, panicle length, panicle stalk diameter, and bract size that help to differentiate *Nolina parryi* from *N. cismontana*. Besides the geographical difference stated above, *N. parryi* is found on granite and granodiorite-derived substrates in the xeric pinyon-juniper woodlands, while *N. cismontana* occurs principally on sandstone and shale substrates of chaparral vegetation. The morphological, geographical, and ecological differences to us warrant the recognition at the species level of the coastal foothills and valleys taxon.

**Nolina cismontana** Dice, sp. nov. TYPE: U.S.A. California: Orange Co., Santa Ana Mts., Trabuco Canyon, 350 m, 1986, *J. Dice & T. Oberbauer 650* [staminate] (holotype, SD 121705; isotypes, ARIZ, NY, RSA, UC).

A specie *Nolina parryi* caulibus brevibus, generaliter < 0.4 m longis; rosulis amplitudine mediocribus, generaliter ex 30–90 foliis constantibus; foliis latitudine mediocribus, 12–30 mm latis accurate super basem expansum; pedunculo inflorescentiae 14–35 mm diametro basi differt.

Shrubs to subshrubs, 0.5–1.5 m tall, few- to many-branched from a woody caudex, branching both above and below ground, with 1–30(–75) leaf rosettes; mature rosettes 0.7–1.6 m diam. with 30–90 leaves per rosette. Leaves green (occasionally glaucous) lance-linear, 0.5–1.4 m long at maturity and 1.2–3 cm wide just above the expanded leaf base; leaf bases white, deltoid-rhomboidal, spoon-shaped, 4–11.5 cm long and 3–8.5 cm wide at base; leaf margins serrulate. Inflorescences large, 1.3–3.1 m tall, 10–40 cm wide, with 25–75 secondary panicle branches, longest secondary branch 13–35 cm long, longest tertiary branch 1–10 cm

long; panicle stalks 1.4–3.5 cm diam. at base, barren the lowermost 0.4–1.5 m; bracts and bractlets large, conspicuous, persistent, lance-linear to deltoid-lanceolate, 10–40 cm long, 1.5–5 cm wide at base (bract subtending lowermost secondary panicle branch); pedicels 2–4 mm long, jointed near middle. Tepals cream to white, ovate, apiculate-mucronate to rounded and introrsely papillate at tip. Staminate flowers broadly campanulate to recurved at anthesis, with outer tepals 3–5 mm long, 1.5–2.5 mm wide; stamens 2–4 mm long; ovaries on short stalks above perianth, 0.5–1.5 mm tall and 1–1.5 mm diam.; styles and stigmatic surfaces greatly reduced or wanting. Carpellate flowers with outer tepals 3–4 mm long, 2 mm wide, and erect to campanulate at anthesis; staminodes 1–2 mm long; ovary on short stalk above perianth, 3 mm tall and 2–3 mm diam.; styles 3, closely appressed but distinct, < 0.5 mm long; stigmatic surface well developed. Fruits papery, 3-lobed capsules, 8–12 mm tall and slightly broader, emarginate at base and apex, bursting irregularly. Seeds ovoid to oblong, 4–5 mm long, 3–4 mm diam.; seed coats reddish brown. N = 19 (Lenz, 1950).

*Distribution*. Cismontane southern California, on dry chaparral-covered slopes extending from the foothills of the Santa Ynez Mountains in western Ventura County, south through the Simi Hills and Santa Ana Mountains to the foothills west of the Palomar and Cuyamaca Mountains in San Diego County. Elevation 230–1275 m.

*Etymology*. The specific epithet "cismontana" means this side of the mountain and refers to the hillside slopes of the foothills of the southern coastal range, where it commonly occurs.

*Common name*. Chaparral nolina, chaparral beargrass.

*Paratypes*. U.S.A. **California:** Orange Co., Santa Ana Mountains, elev. 365 m, 1986, *J. Dice & T. Oberbauer 651* [pistillate] (ARIZ, NY, RSA, SD, UC).

With the recognition of *Nolina cismontana*, the synonymy for *Nolina parryi* has to be updated.

**Nolina parryi** S. Watson, Proc. Amer. Acad. Arts 14: 247. 1879. *Nolina bigelovii* (Torrey) S. Watson var. *parryi* (S. Watson) L. D. Benson, Bull. Univ. Arizona 15: 384. 1945. *Nolina bigelovii* subsp. *parryi* (S. Watson) E. Murray, Kalmia 13: 10. 1983. TYPE: U.S.A. California: [probably Riverside Co.] desert E of San Bernardino, *Parry s.n.* (holotype, GH; isotype, MO).

*Nolina parryi* S. Watson subsp. *wolfii* Munz in Munz & Roos, Aliso 2(3): 221. 1950. *Nolina bigelovii* var. *wolfii* (Munz) L. D. Benson, in Benson & Darrow, Trees Shrubs Southwest. Deserts 72. 1954. *Nolina wolfii* (Munz) Munz, Fl. S. Calif. 865. 1974. *Nolina bigelovii* (Torrey) S. Watson subsp. *wolfii* (Munz) E. Murray, Kalmia 13: 10. 1983. TYPE: U.S.A. California: eastern San Bernardino Co., Mojave Desert, Kingston Mountains, 0.5 mi. W of Beck Spring (Crystal Spring on herbarium labels), *Wolf 7655* (holotype, RSA; isotypes, A, DS, F, GH, JEPS, LA, MO, NY, POM, SD, UC, US).

The key to *Nolina* in *The Jepson Manual* (Dice, 1993) does not reflect the presence of *N. cismontana*, although there is mention of an undescribed species under the description of *N. parryi*. The key below is adapted from Dice (1988).

KEY TO THE SPECIES OF *NOLINA* IN CALIFORNIA

1a. Old leaf margins fibrous-shredding; inflorescence bracts deciduous; seeds gray ..... *Nolina bigelovii*

1b. Leaf margins minutely and persistently serrate; inflorescence bracts persistent; seeds reddish brown.

2a. Aboveground stems not obvious; mature rosettes with < 45 leaves; leaf bases barely expanded; inflorescences < 1.6 m, base of stalk 0.5–1.8 cm diam.; bracts small, inconspicuous ..... *Nolina interrata*

2b. Aboveground stems obvious; mature rosettes with 45–200 leaves; leaf bases strongly expanded; inflorescences 1.6–4 m, base of stalk 1.4–9 cm diam.; bracts large, papery.

3a. Stems 0.3–2.1 m long; rosettes with 65–200 leaves; leaves 20–40 mm wide just above expanded leaf base; inflorescence stalks 2.6–9 cm diam. at base ..... *Nolina parryi*

3b. Stems up to 0.4 m long; rosettes with 30–90 leaves; leaves 12–30 mm wide just above expanded base; inflorescence stalks 1.4–3.5 cm diam. at base ..... *Nolina cismontana*

*Conservation status*. *Nolina cismontana* was recently added to the U.S. Fish and Wildlife Service's (USFWS) list of plant taxa native to the United States that are being reviewed for possible addition to the List of Endangered and Threatened Plants under the Endangered Species Act of 1973, as amended (Department of the Interior, Fish and Wildlife Service, 1993). In USFWS's most recent review, *N. cismontana* (as *Nolina* sp. nov. ined., chaparral bear-grass from California) is treated as a Category 2 candidate species for listing under the Federal Endangered Species Act. Category 2 candidate species are "taxa for which information now in the possession of the Service indicates that pro-

posing to list as endangered or threatened is possibly appropriate, but for which sufficient data on biological vulnerability and threat are not currently available to support proposed rules." *Nolina cismontana* is also deserving of consideration from the California Department of Fish and Game for possible inclusion in their list of plant species of special concern and by the California Native Plant Society for inclusion in their Inventory of the Rare and Endangered Vascular Plants of California.

Throughout most of its range, from Ventura County through northern San Diego County, *Nolina cismontana* is threatened by residential and commercial land development. At present the only protected populations of significant sizes are the Viejas Mountain population in southern San Diego County, which lies within the U.S. Forest Service's Cleveland National Forest; the California Department of Fish and Game's Coal Canyon Ecological Reserve in the Santa Ana Mountains of eastern Orange County; and scattered holdings within the Cleveland National Forest in the Santa Ana Mountains.

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Literature Cited

Department of the Interior, Fish and Wildlife Service. 1993. 50 CFR Part 17: Endangered and Threatened wildlife and plants; Review of plant taxa for listing as Endangered or Threatened species. Federal Register 58(188): 51144–51190. Thursday, September 30, 1993.

Dice, J. C. 1988. Systematic Studies in the *Nolina bigelovii–N. parryi* (Nolinaceae) Complex. M.S. thesis, San Diego State University, San Diego, California.

———. 1993. *Nolina*. P. 1203 *in* J. C. Hickman (editor), The Jepson Manual: Higher Plants of California. Univ. California Press, Berkeley, California.

Lenz, L. W. 1950. Chromosome numbers of some western American plants, I. Aliso 2(3): 317–318.

Munz, P. A. & J. C. Roos. 1950. California miscellany II. Aliso 2(3): 217–238.

Watson, S. 1879. XV. Contributions to American botany. I. Revision of the North American Liliaceae. Proc. Amer. Acad. Arts 14: 213–303.

# Nomenclatural Changes in *Polygonum*, *Persicaria*, and *Aconogonon* (Polygonaceae)

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ABSTRACT. *Polygonum caurianum* subsp. *hudsonianum* is raised to species rank. *Polygonum bistortoides* is transferred to *Persicaria*, and *Polygonum alaskanum* var. *glabrescens* is transferred to *Aconogonon*.

For the forthcoming treatment of *Polygonum* s.l. for the *Flora of North America*, several new nomenclatural combinations are required to reflect new knowledge in the taxonomy of this group.

*Polygonum caurianum* B. Robinson subsp. *hudsonianum* S. J. Wolf & McNeill is raised to species rank as *Polygonum hudsonianum* (S. J. Wolf & McNeill) Hinds, and the new combinations *Persicaria bistortoides* (Pursh) Hinds and *Aconogonon alaskanum* (W. Wight ex Hultén) var. *glabrescens* (Hultén) Hinds are made.

**Polygonum hudsonianum** (S. J. Wolf & McNeill) Hinds, stat. et comb. nov. Basionym: *Polygonum caurianum* B. L. Robinson subsp. *hudsonianum* S. J. Wolf & McNeill, Rhodora 88: 856. 1986. TYPE: Canada. Québec, Fort George, Baie James, 30 Aug. 1950, *Lepage 12863* (holotype, DAO).

*Polygonum hudsonianum* forms part of a complex of species within section *Polygonum* that includes *P. fowleri* B. L. Robinson and *P. caurianum* B. L. Robinson. Examination of relevant collections has led me to the conclusion that *P. hudsonianum* is more closely related to *P. fowleri* than to *P. caurianum*. There appears to be a clear distinction between *P. caurianum* and *P. hudsonianum* based partly on size but also on features of the perianth,

Table 1. Morphological comparison between *Polygonum fowleri*, *P. hudsonianum*, and *P. caurianum*.

| | *P. fowleri* | *P. hudsonianum* | *P. caurianum* |
|---|---|---|---|
| Fruiting perianth | | | |
| Size (mm) | 3.0–4.5, mean 3.75 | (2.3–)2.5–3.2(–3.5), mean 2.9 | 1.6–2.3(–3), mean 2.3 |
| Shape | broadly pouched | ± pouched at base | tapering to base of lobes |
| Color | light green | greenish to roseate | roseate |
| Lobes | cucullate; overlapping except late season ones | cucullate; ± overlapping | not cucullate; ± flat, flared and curved outward |
| Achenes | | | |
| Size (mm) | (2.5–)3.0–3.7(–4.0), mean 3.3 | (1.8–)2.0–2.5(–3.1), mean 2.2 | 1.4–1.6(–2.2), mean 1.7 |
| Shape, surface texture, and cross section | broadly ovate, beaked; granular roughened; 2 equal and 1 broader side, many biconvex | broadly ovate-lanceolate; ± beaked; roughened to definitely striate-papillate; variable in cross section, many biconvex | ovate-lanceolate; not or only obscurely beaked; rough to faintly striate-papillate; mostly 1 narrow and 2 broader sides |
| Included or excluded | included except late season ones all exserted | included or slightly exserted; late season ones all exserted | all exserted |
| Leaves | light to dark green or ± reddish | reddish tinged | reddish to purplish tinged |
| Distribution | NE & NW coastal US & Canada; S coastal Alaska; James Bay, W Hudson Bay | centered E of Hudson Bay & N of St. Lawrence River, Québec | centered in NW Alaska, Yukon & NW Northwest Territories |

achene, and distribution (Table 1). Separation between *P. fowleri* and *P. hudsonianum*, however, is more difficult. Many characteristics are shared by these two taxa, including the expanded base of the perianth (pouched), cucullate three outer sepals, and beaked achenes. As Table 1 indicates, however, there are enough quantitative and qualitative differences between the two taxa upon which to recognize *P. hudsonianum* as a species.

The description in Wolf & McNeill (1986) of *Polygonum caurianum* subsp. *hudsonianum* should be amended to include characteristics as indicated in Table 1.

**Persicaria bistortoides** (Pursh) Hinds, comb. nov. Basionym: *Polygonum bistortoides* Pursh, Fl. Amer. Sept., 1: 271. 1814. *Bistorta bistortoides* (Pursh) Small, Bull. Torrey Bot. Club 33: 57. 1906. TYPE: [U.S.A. Idaho:] "Quamash Flats, banks of the Missouri," now called Weippe Prairie, Clearwater Co., 20 June, *M. Lewis*, 1806 (holotype, PH).

*Persicaria* (sect. *Bistorta*) *bistortoides* is closely related to *Persicaria bistorta* (L.) G. Sampaio. It is recognized based on the research of Ronse Decraene & Akeroyd (1988), whose studies of floral morphology in the Polygonaceae support including the *Bistorta* group in the genus *Persicaria*.

**Aconogonon alaskanum** (W. Wight ex Hultén) Soják var. **glabrescens** (Hultén) Hinds, comb. nov. Basionym: *Polygonum alaskanum* W. Wight ex Hultén var. *glabrescens* Hultén, Acta. Univ. Lund. N.F. Avd. 2, 40(1) 4: 612. 1944. TYPE: U.S.A. Alaska: Bonanaza Creek, 19 June 1924, *Eastwood 298* (holotype, GH).

Chambers (1992) clarified the correct name in *Aconogonon* for this species, but because he preferred to include these taxa in *Polygonum*, left the publication of this new combination to someone else.

*Acknowledgment.* I wish to acknowledge the considerable assistance of George H. Flanders, Jr.

Literature Cited

Chambers, K. L. 1992. Choosing the correct name for *Aconogonon* (*Polygonum* sect. *Aconogonon)* in Alaska. Rhodora 94: 319–322.

Ronse Decraene, L.-P. & J. R. Akeroyd. 1988. Generic limits in *Polygonum* and related genera (Polygonaceae) on the basis of floral characters. Bot. J. Linn. Soc. 98: 321–371.

Wolf, S. J. & J. McNeill. 1986. Synopsis and achene morphology of *Polygonum* section *Polygonum* (Polygonaceae) in Canada. Rhodora 88: 457–479.

# Una Especie Nueva de *Rhamnus* (Rhamnaceae) del Cerro Salomón, Sierra Atravesada, Oaxaca, México

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RESUMEN. Se describe *Rhamnus wendtii* del Cerro Salomón, Sierra Atravesada, Oaxaca, México, como especie nueva que parece estar emparentada a *R. mcvaughii*. Se conoce solamente de la localidad tipo, de selvas bajas perennifolias y bosques cercanos.

ABSTRACT. *Rhamnus wendtii* is described as a new species from Cerro Salomón, Sierra Atravesada, Oaxaca, Mexico, with apparent affinities to *R. mcvaughii*. It is known only from the type locality, in elfin forest and surrounding vegetation.

El Cerro Salomón se encuentra ubicado en el límite entre los municipios de Santa María Chimalapa y San Miguel Chimalapa en el distrito de Juchitán, Oaxaca, México (Fig. 1), al noreste de la Congregación de Benito Juárez y aproximadamente a 44 km en línea recta al norte de San Pedro Tapanatepec, a 16°46′15″ latitud norte y 94°11′45″ longitud oeste. La altitud de la cresta es entre 1700 a 1950 m. Fisiográficamente el Cerro Salomón pertenece a la Sierra Madre de Chiapas, que se extiende en forma paralela a la Costa del Pacífico y corre desde el Istmo de Tehuantepec a través de Chiapas hasta Guatemala. Las rocas de la Sierra Madre de Chiapas son muy antiguas, siendo plutones del paleozóico, compuesto de rocas graníticas, granodioríticas y dioríticas, con rocas metamórficas aún más viejas de edades precámbricas y paleozoicas; la sierra ha estado elevada sobre el nivel del mar en forma continua por lo menos desde principios del Terciario (Ferrusquía-Villafranca, 1993). El Cerro Salomón se encuentra en el extremo noroccidental dentro de este macizo montañoso, ya cerca del Istmo de Tehuantepec, formando parte de la Sierra Atravesada, en un área de suelos arenosos provenientes de viejas rocas metamórficas (esquistos y gneis) (Ferrusquía-Villafranca, 1993; López Ramos, 1974).

La cubierta vegetal del lugar está constituído por varios tipos de bosque mesófilo de montaña altos y bajos, con bosque de pino en los sitios más expuestos; en la parte superior del cerro se establecen dos manchones de vegetación de baja estatura (selva baja perennifolia) rodeados por comunidades más altas. Ishiki (1988) publicó una lista florística de las selvas bajas perennifolias del Cerro Salomón, pero el listado de los bosques mesófilos que la rodean no es completo. Dentro de las novedades encontradas durante el trabajo de campo tenemos el siguiente.

**Rhamnus** (subgen. *Frangula*) **wendtii** Ishiki, sp. nov. TIPO: México. Oaxaca: Mpio. San Miguel Chimalapa, Cima del Cerro Salomón, al NO de la Congregación Benito Juárez, ca. 44 km en línea recta al N de San Pedro Tapanatepec, filo del Cerro con selva baja perennifolia, 16°46′15″N, 94°11′45″O, 1830 m, 16 abr. 1986 (fl, fr), *Ishiki 1575* (holótipo, MEXU; isótipo, CHAPA). Figura 2.

Ex affinitate *R. mcvaughii* L. A. & M. C. Johnston. Cataphylla nula; stipulae persistentes 2–3 mm longae; petioli 6.0–12.5 mm longi; laminae membranaceae, coriaceae, ellipticae, oblongae, (3.6–)5.8–7.0(–8) cm longae, (1.4–)1.9–2.3(–2.5) cm latae, (2.6–)3(–3.2)-plo longiores quam latiores, basi cuneatae, apice acuminatae, margine crenatae; nervis lateralibus utroque latera (4–)5–6(–7) sub angulo circa (35–)40–50° abeuntibus, supra ad costam laete pubescentes, subtus ad costam et nervos laterales pubescentes pilis 0.4 mm longis; flores 5-meri; pedicelli fructiferi demum 12–15(–16) mm longi; cupula floralis sub fructa demum integra; drupa 6–7 mm diametro; putamina 3.

Arbusto o árbol pequeño de 1–2 m de alto, corteza obscura un poco rojiza en las partes viejas; ramitas con abundantes pelos adpresos de 0.4 mm de largo en las partes jóvenes y con pelos erectos de (0.1–)0.15–0.2 mm de largo a glabras en las partes viejas, en la parte intermedia con ambos tipos de tricomas; escamas de la yema ausente. Hojas alternas, lámina membranosa a coriácea, elíptica a oblonga, (3.6–)5.8–7.0(–8) cm de largo, (1.4–)1.9–2.3(–2.5) cm de ancho, (2.6–)3(–3.2) veces más largo que ancho, base cuneada, ápice acuminado, margen crenado con (4–)5–6(–8) dientes dispuestos en los dos tercios distales de la lámina, a intervalos de (2.5–)4.0–8.5(–14.5) mm y 1–3(–4) dientes por cm, haz verde obscuro, glabro, ligeramente pubescente en el nervio central, envés verde amarillento-

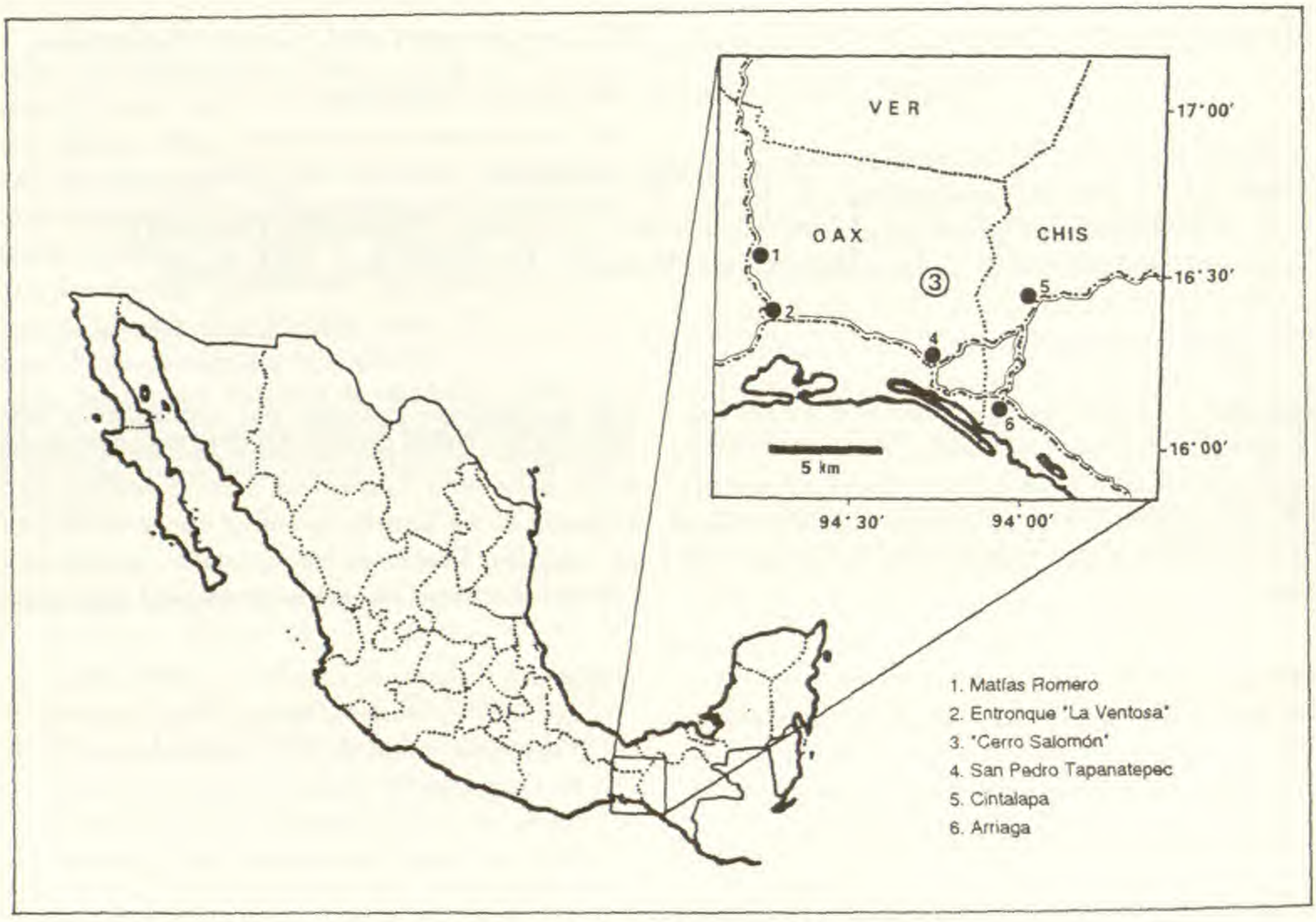


Figura 1. Ubicación geográfica del área de estudio.

cafesoso, glabro, ligeramente pubescente con pelos adpresos y aislados de 0.4 mm en el nervio central y lateral, y seríceo con pelos de 0.4 mm de largo en las axilas de los nervios, venación eucamptódroma con (4–)5–6(–7) pares de nervios laterales con ángulo de (35–)40–50° al nervio central; pecíolo de 6–12.5 mm de largo, con abundantes pelos adpresos de 0.4 mm de largo; estípulas de 2–3 mm de largo, pubescentes, obscuras, persistentes. Flores 1 o 2 por axila, pedúnculo ausente o muy pequeño; pedicelo de 11–12 mm de largo, pubescente, con pelos erectos de 0.1 mm de largo y en ocasiones algunos pelos adpresos de 0.5 mm de largo; copa floral de 1.3–1.5 mm de largo, 2–2.5 mm de diámetro, poco pubescente; sépalos 5, deltoideos, triangulares, 1.5–1.8 mm de largo, 1.4–1.5 mm de ancho en la base, interior glabro, exterior con pelos aislados de 0.1–0.2 mm de largo; pétalos 5, cuculados y hendidos, 1–1.4 mm de largo, 1–1.5 mm de ancho, alternos a los sépalos; estambres 5, filamentos de 0.5–0.85 mm de largo, triangulares con la base ancha (0.3–0.4 mm), opuestos a los sépalos; anteras 0.8 mm de largo, introrsas, dorsifijas, cada una abrazada por un pétalo, con dehiscencia longitudinal; polen tricolpado, heteropolar con simetría bilateral, angulaperturado de 9.5 $\mu$m de diámetro ecuatorial, superficie ondulada y perforada (foveolada) (Fig. 3); ovario glabro, 1–1.25 mm de diámetro, 0.7 mm de alto, estilo 0.8–0.95 mm de largo, estigma trilobado. Frutos 1 a 2 por axila; pedicelo en la fructificación de 12–15(–16) mm de largo; copa floral circular, borde entero, sin restos del perianto, de 1.5–3 mm de diámetro, 1 mm de profundidad; fruto drupáceo, globoso, glabro, de 6–7 mm de diámetro en fresco, café obscuro, casi negro al madurar (pasando por un color rojo-vino), con 3 pirenos; mericarpios elíptico-ovados, de 4–5 mm de largo, 4 mm de ancho, endocarpio de 0.15–0.2 mm de grosor; semillas una por mericarpio, testa negra, ligeramente fusionada con el endocarpio, muy delgada; endosperma una capa amarilla hasta de 0.3 mm de grosor; cotiledones suborbiculares, engordados, ca. 4 mm de largo, ca. 4 mm de ancho cada uno, ca. 0.6 mm de grosor; germinación criptocotilar y epígea.

*Hábitat.* En selvas bajas perennifolias con *Weinmannia glabra* L.f., *Gaultheria odorata* Kunth, *Rapanea juergensenii* Mez, *R. myricoides* (Schlechtendal) Lundell, *Cavendishia bracteata*(Ruiz & Pavon ex J. St.-Hilaire) Hoerold, *Satyria warszewiczii* Klotzsch, *Disterigma*, *Clethra*, *Liquidambar* y abundantes lauráceas y melastomatáceas; con estrato superior abierto de *Pinus oocarpa* Schiede ex Y. Schechter var. *trifoliata* Martínez. Suelo limo-arenoso, con abundante hojarasca y musgo (*Sphagnum*), y altitudes de 1800 a 1950 m.

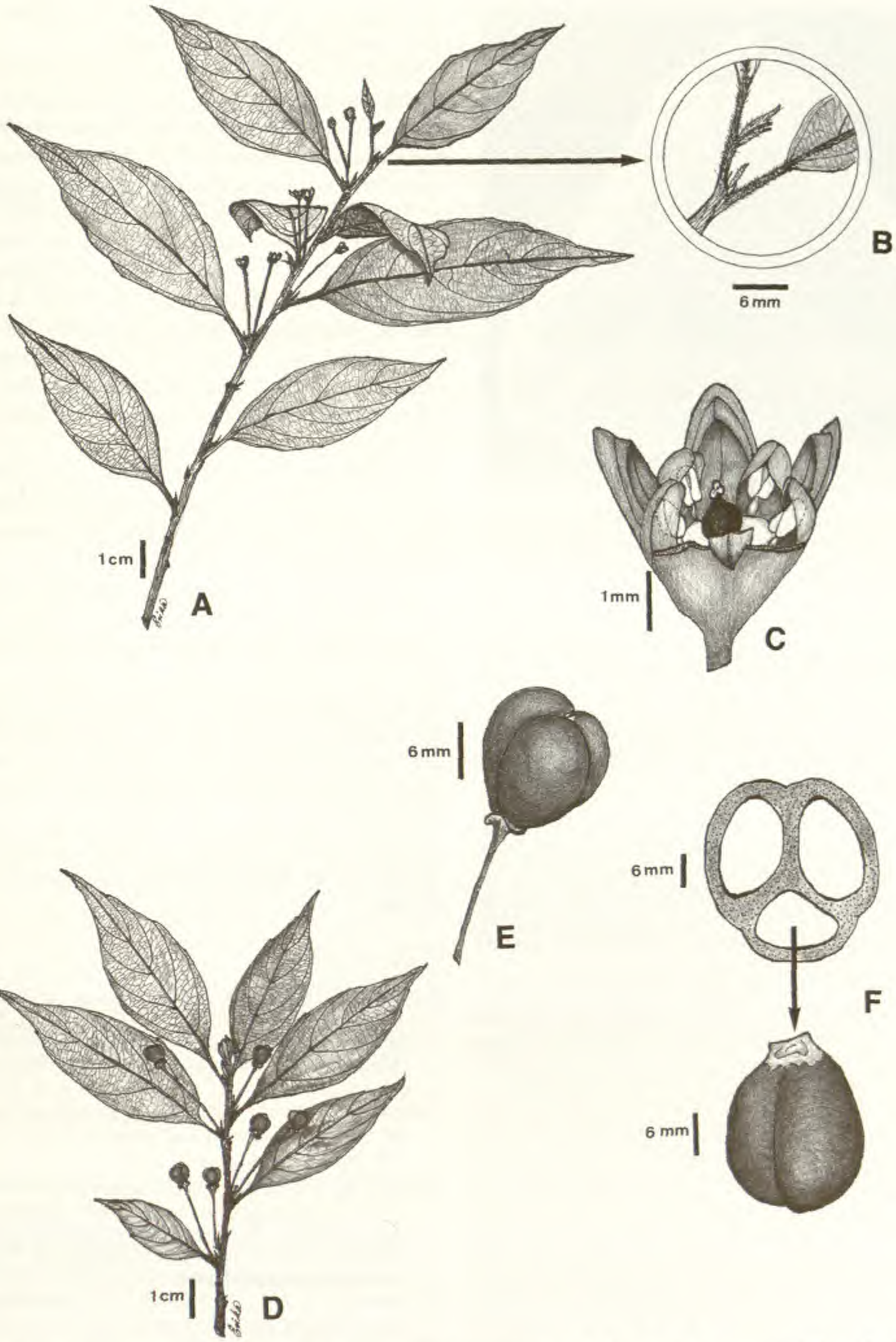


Figura 2. *Rhamnus wendtii* Ishiki. —A. Rama con inflorescencia. —B. Detalle de la rama y de la estípula. —C. Flor con los sépalos y pétalos anteriores parcialmente eliminados. —D. Rama con fructificación. —E. Fruto maduro con la copa floral circular. —F. Corte transversal del fruto que muestra las tres semillas y semilla (A, *Ishiki 1527*; B–C, *Ishiki 1338*; D–F, *Ishiki 1575*).

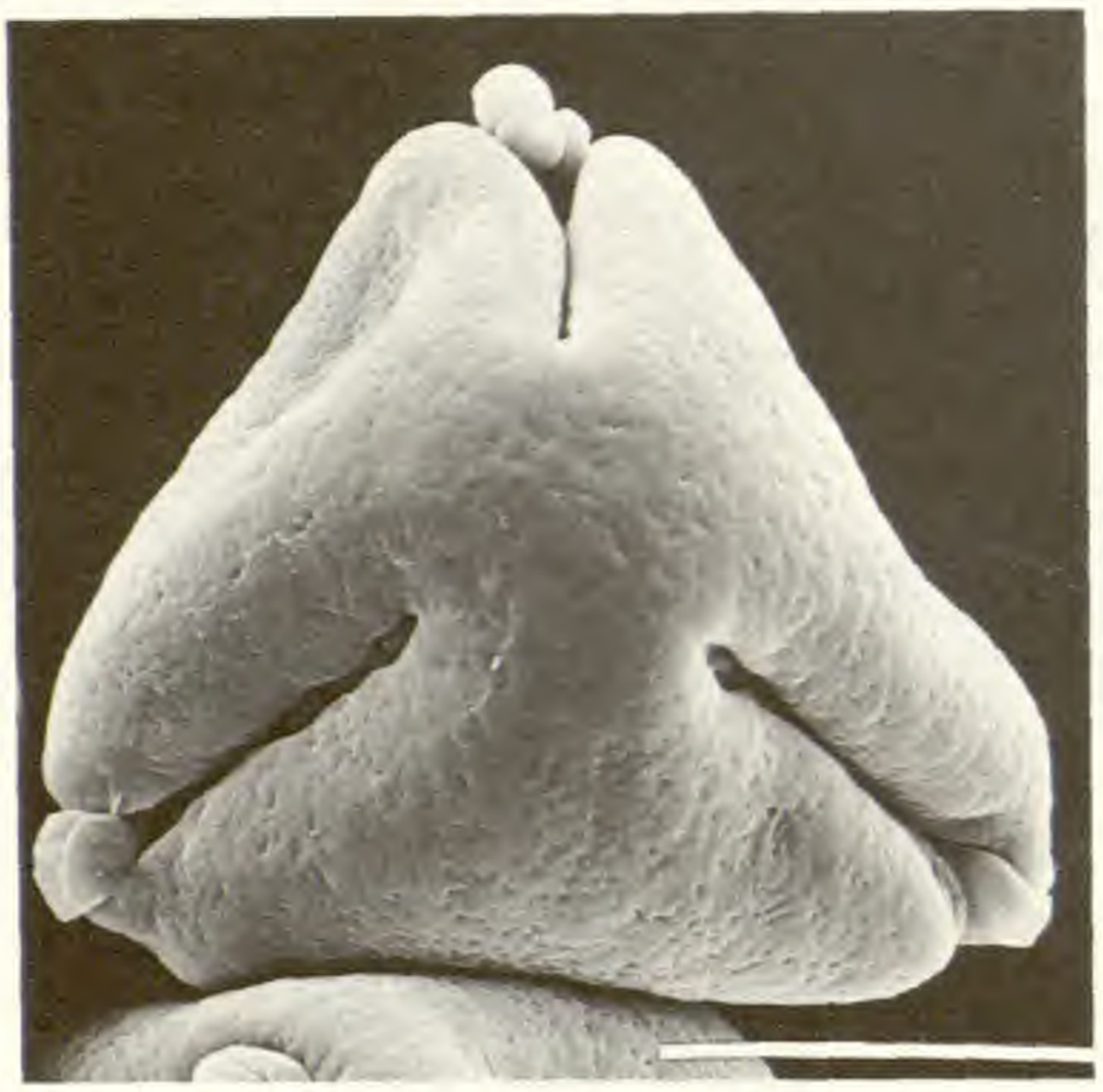

Figura 3. Microfotografía electrónica de barrido (SEM) del grano de polen de *Rhamnus wendtii* Ishiki (barra = 3.2 μm).

*Distribución.* Unicamente se ha localizado en la localidad tipo, en comunidades de bosque de pino-encino y selva baja perennifolia. Por ser una región muy poco conocida botánicamente, es posible que existen otras poblaciones en otros cerros cercanos de Oaxaca y Chiapas.

*Paratipos.* MEXICO. **Oaxaca:** Mpio. San Miguel Chimalapa, Localidad tipo, 11 feb. 1986 (fl), *Ishiki 1263*; (fr), *Ishiki 1338*; 16 abr. 1986 (fr), *Ishiki 1466*; (fl, fr), *Ishiki 1506*; (fl, fr), *Ishiki 1527*; (fr), *Ishiki 1545*; (fl), *Ishiki 1603*; (fr), *Ishiki 1644*; 20 ago. 1986 (fr), *Ishiki 1710*; 15 oct. 1986 (fl, fr), *Ishiki 1791* (MEXU, CHAPA).

Siguiendo la clasificación de Wolf (1938), Grubov (1949), Suessenguth (1953) y Johnston & Johnston (1978), *R. wendtii* pertenece al subgénero *Frangula* por la ausencia de escamas en la yema, inflorescencia una umbela con pedúnculo o sésil, flores perfectas, la presencia de sépalos, frutos de color negro o púrpura al madurar, fruto indehicente, y endosperma escaso o ausente. Johnston & Johnston (1978) no reconocen grupos de especies o series dentro de las especies Neotropicales de *Rhamnus* subgénero *Frangula* y consideran que forman una unidad filética compacta y la necesidad de realizar más estudios para dilucidar el problema. La especie más emparentada probablemente es *R. mcvaughii*, especie distribuida desde Hidalgo hasta el centro de Oaxaca. *Rhamnus mcvaughii* difiere de la nueva especie en las hojas más pequeñas (1.6–5.5(–7.5) × 0.8–1.9(–2.6) cm) con ápice frecuentemente obtuso o agudo, las venas secundarias más numerosas (6–12 pares) formando un ángulo más abierto (mayor de 50°), y con mayor número de dientes marginales por centímetro ((4–)5–8(–9)). Habita altitudes superiores a los 2000 msnm.

En la clave de Johnston y Johnston (1978), la especie nueva frecuentemente se determinaría como *R. mucronata* Schlechtendal, especie distribuida desde Michoacán hasta El Salvador, en matorrales, bosque de pino-encino, bosque de oyamel, a altitudes de (1500–)1900–2800(–3000) m. *Rhamnus mucronata* difiere de la especie nueva en los pedicelos más cortos (5–7(–13) mm) y las hojas ligeramente más grandes (1.9–8.5(–13) × (0.7–)0.9–3.2(–4) cm) con venas laterales más numerosas (6–10(–13)) en un ángulo más abierto y con mayor número de dientes marginales por centímetro (3–6(–8)), y la inflorescencia con mayor número de flores (1–5(–10)).

El epíteto de la especie nueva honra a Thomas L. Wendt, estudioso de la Flora Tropical de México, quien fungió en una parte importante de mi formación botánica.

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Literatura Citada

Ferrusquía-Villafranca, I. 1993. Geology of Mexico: A Synopsis. Pp. 3–107 *in* T. P. Ramamoorthy, R. Bye, A. Lot & J. Fa (editores), Biological Diversity of Mexico: Origins and Distributions. Oxford Univ. Press, New York.

Grubov, V. I. 1949. Rhamnales. Pp. 485–516 *in* B. K. Shishkin (editor), Flora of the U.S.S.R. Volume 14. Moskva-Leningrad.

Ishiki I., M. 1988. Las Selvas Bajas Perennifolias del Cerro Salomón, Región de Chimalapa, Oaxaca: Flora, Comunidades y Relaciones Fitogeográficas. Tesis de Maestría. Centro de Botánica, Colegio de Postgraduados, Chapingo, México.

Johnston, M. C. & L. A. Johnston. 1978. *Rhamnus*. Flora Neotropica 20: 1–96.

López Ramos, E. 1974. Carta Geológica del Estado de Oaxaca, 2° Ed. [Provisional]. Instituto de Geología, U.N.A.M., México, D.F.

Suessenguth, K. 1953. Rhamnaceae. Pp. 7–173 *in* A. Engler & K. Prantl (editores), Die Natürlichen Pflanzenfamilien. Band 20D. Wilhelm Engelmann, Leipzig.

Wolf, C. B. 1938. The North American species of *Rhamnus*. Rancho Santa Ana Bot. Gard. Monogr., Bot. Ser. 1: 1–136.

# New Species and Combinations in *Millettia* Wight & Arnott and *Pongamiopsis* R. Viguier (Leguminosae–Papilionoideae–Millettieae) from Madagascar

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ABSTRACT. Morphological characters support the description of five new species of *Millettia*, *M. capuronii* Du Puy & Labat, *M. hitsika* Du Puy & Labat, *M. nathaliae* Du Puy & Labat, *M. orientalis* Du Puy & Labat, and *M. taolanaroensis* Du Puy & Labat, and one new species of *Pongamiopsis*, *P. viguieri* Du Puy & Labat, from Madagascar. The genus *Neodunnia* R. Viguier is considered to be a synonym of *Millettia*, and two new combinations, *M. aurea* (R. Viguier) Du Puy & Labat and *M. richardiana* (Baillon) Du Puy & Labat, are made.

RÉSUMÉ. L'étude des caractères morphologiques permet la description de cinq nouvelles espèces de *Millettia*: *M. capuronii* Du Puy & Labat, *M. hitsika* Du Puy & Labat, *M. nathaliae* Du Puy & Labat, *M. orientalis* Du Puy & Labat, et *M. taolanaroensis* Du Puy & Labat, et une nouvelle espèce de *Pongamiopsis*, *P. viguieri* Du Puy & Labat, de Madagascar. Le genre *Neodunnia* R. Viguier est considéré comme étant un synonyme de *Millettia* et deux nouvelles combinaisons, *M. aurea* (R. Viguier) Du Puy & Labat and *M. richardiana* (Baillon) Du Puy & Labat, sont faites.

Prior to completion of an account of the subfamily Papilionoideae in Madagascar, six new species are described and illustrated and two new combinations are made in the closely related genera *Millettia* and *Pongamiopsis*.

*Millettia* Wight & Arnott, with about 100 species, is one of the largest genera of the tribe Millettieae. The genus is mainly paleotropical, occurring in Asia and Africa, with only about five species in California and Mexico (formerly regarded as a separate genus *Hesperothamnus* T. S. Brandegee, see Geesink, 1984: 102–106). Prior to the present publication, only one variable species, *M. lenneoides* Vatke, a small tree, shrub, or liane was recognized in Madagascar: a total of eight species, all endemic, are now known to occur on the island. They are widely distributed throughout lowland Madagascar, but do not occur on the Central Plateaux.

Hutchinson (1964) considered *Neodunnia* R. Viguier to be a synonym of *Millettia*, but it was regarded as a separate genus by Geesink (1981, 1984) on the basis of its solitary flowers produced from the bud scales or lowest nodes of new, emerging shoots. In fact, in *M. (Neodunnia) richardiana*, the flowers are produced in a cluster of 2–4 on a very short peduncle, the inflorescence being a reduced pseudoraceme. The second species, *M. (Neodunnia) aurea*, has a similar inflorescence but with the axis somewhat elongated and the flowers in two or three distant clusters: this species and the newly described *M. nathaliae* are intermediate with the main group of species with multi-flowered pseudoracemes. These species are otherwise very similar to other, more typical, *Millettia* species in Madagascar, and *Neodunnia* is not considered here to be distinct.

*Pongamiopsis* R. Viguier is a genus of three species endemic to Madagascar (including the new species *P. viguieri*, described here). It is closely allied to *Millettia*, differing in its very swollen, elipsoid pods, which do not taper toward the base, and its seeds, which are spherical or reniform, not flat and discoid as in *Millettia* species. The seeds also lack the rim aril extended into a short flap on one side, which is characteristic of *Millettia* in Madagascar.

**Millettia capuronii** Du Puy & Labat, sp. nov. TYPE: NE Madagascar. [Near Sambava], S de la basse Bemarivo, versant oriental de l'Ambatobiribiry, 100–330 m, 9 Avr. 1967 (fl), *Service Forestier de Madagascar 27670-SF, R. Capuron* (holotype, P; isotypes, K, L, MO, P, TEF). Figure 1.

Figure 1. *Millettia capuronii* Du Puy & Labat. —A. Habit. —B, C. Leaflet undersurface. —D. Flower. —E. Calyx. —F. Young pod. —G. Pod. —H. Seed. (A–F drawn from *Service Forestier de Madagascar SF 27670*, and G and H from *Service Forestier de Madagascar SF 10027*.)

Species apice foliolorum contracto, foliis et leguminibus glabris, et inflorescentiis cum axibus secundariis brevibus et gracilibus pares apicales florum gerentibus distincta.

A deciduous tree 4–8 m tall, flowering on young, developing shoots; [DBH not known]; twigs glabrous wih raised lenticels and small, spherical dormant buds. Leaves with 5–11 opposite leaflets; rachis glabrous; stipels absent. Leaflets ovate, 25–55 × 15–40 mm, obtuse to rounded basally, the apex acuminate and tapering into a short to long drip tip, finally obtuse and mucronate, entirely glabrous, paler beneath. Pseudoracemes delicate, ca. 4–6 cm long, from the leaf axils near the base of new growths, the flowers toward the base of the inflorescence paired on short, slender secondary axes up to 6 mm long; pedicels with a pair of minute, filiform bracteoles near the middle which are caducous before the flower opens. Flowers ca. 12–15 mm long, violet. Calyx 3–4 mm long, subglabrous with a minutely ciliate margin, with 5 short, broadly triangular teeth,

the upper pair smallest and close together. Standard limb ca. 10 × 10 mm, cuneate basally, finely and sparsely appressed pubescent behind. Wings as long as the keel. Staminal sheath ca. 9 mm long. Pods obovate to oblong-obovate, flat, 65–80 × 15–20 mm, tapering toward the base, the apex rounded and beaked, glabrous, splitting into 2 twisted, woody valves, with 1–4 seeds. Seeds oblong-discoid, ca. 10 × 10 mm, chestnut brown, the aril extended into a short flap on one side.

*Millettia capuronii* is recognizable by its tapering leaflet apices, its glabrous leaves and pods, and its distinctive inflorescences with short, slender secondary axes bearing apical pairs of flowers.

*Distribution.* Eastern Madagascar, collected infrequently but in widespread localities along the eastern coastal region including Fort Dauphin (Taolañaro), Farafangana, and Sambava.

*Habitat.* Lowland evergreen forest near the coast, at low altitudes.

*Flowering time.* Only recorded in April.

*Vernacular name.* Sikidihazo.

This species is dedicated to René Capuron, collector of the type specimen, in recognition of his outstanding contributions to the knowledge of the forest flora of Madagascar.

*Paratypes.* MADAGASCAR. Prov. de Toliara, Préfecture Taolañaro (Fort Dauphin), forêt à 5 km de Ste. Luce, au N de Maliaforaky, 24°46′S, 47°09′E, 0–10 m, 28 Avr. 1989 (st), *Rabevohitra, Dumetz & Gereau 1946* (MO, P, TAN); Prov. de Toliara, Préfecture de Fort Dauphin, forêt ombrophile de Manatantely, 50–250 m, 9 Nov. 1990 (jfr), *Rabevohitra 2426* (MO, P, TAN); Dct. de Farafangana, Andafia, 20 Avr. 1953 (fr), *Service Forestier de Madagascar 10027-SF* (P, TEF).

**Millettia hitsika** Du Puy & Labat, sp. nov. TYPE: E Madagascar. Forêt d'Analalava, Fenoarivo, 4 km W de Foulpointe, 20–50 m, 3 Déc. 1958 (fl), *Service Forestier de Madagascar 20154-SF, R. Capuron* (holotype, P; isotypes, K, L, MO, P, TEF). Figure 2.

Species habitu tenui et delicato et foliolis cum apice acuto, supra glabris et subtus appresso-pubescentibus distincta; a *M. orientalis* differt foliis, foliolis, inflorescentibus et floribus magnopere parvioribus.

A deciduous tree or shrub to 10 m tall, flowering on new, developing shoots soon after they emerge from the buds; DBH 18 cm (one record only); twigs brownish pubescent when young, glabrescent with rounded dormant buds when mature. Leaves with 9–13 opposite leaflets; rachis pubescent when young; stipels absent. Immature leaflets narrowly elliptic, [mature leaflets not known], acute and mucronate apically, glabrous except for the midvein above, densely covered in short, appressed hairs beneath. Flowers in delicate pseudoracemes 4–9.5 cm long from the lowest nodes and leaf axils on very young shoots with developing leaves, the flowers solitary or paired on very short side spurs up to 1.5 mm long; pedicels with a pair of very small, filiform bracteoles up to 3 mm long which are caducous before the flower opens. Flowers 10–12 mm long, [pink or violet]. Calyx 2.5–4 mm long, brownish pubescent, with 5 short, broadly triangular teeth, the upper pair smallest and close together. Standard limb ca. 10 × 10 mm, thinly pubescent behind. Wings as long as the keel. Staminal sheath 8–9 mm long. [Pods and seeds not known.]

*Millettia hitsika* is characterized by its fine, delicate habit and by its narrow (immature) leaflets with acute apices, which are glabrous above and appressed-pubescent beneath. It is only known in flower with immature foliage, in which it somewhat resembles *Pongamiopsis pervilleana* (Baillon) R. Viguier. It is easily distinguished from *M. orientalis*, the only other *Millettia* species that occurs in the humid, eastern forests, a much more robust species with much larger leaves, leaflets, inflorescences, and flowers.

*Distribution.* Eastern Madagascar, on the coastal plain, from Ambila-Lemaitso to Foulpointe.

*Habitat.* In evergreen forest on sand, at up to ca. 50 m altitude.

*Flowering time.* October–March.

*Local uses.* The wood is used in construction.

*Vernacular name.* Hitsika.

The species name is derived from the vernacular name for this species.

*Paratypes.* MADAGASCAR. Ambila Lemaitso, 13 Mar. 1951 (fl), *Service Forestier de Madagascar 3260-SF* (K, P, TEF); Ambila Lemaitso, 15 Jan. 1953 (fl), *Service Forestier de Madagascar 7257-SF* (P, TEF); Dct. de Brickaville, Ambila Lemaitso, sous parcelle F2K, 20 Fév. 1958 (fl), *Service Forestier de Madagascar 19002-SF* (P, TEF).

**Millettia nathaliae** Du Puy & Labat, sp. nov. TYPE: N Madagascar. Track to Irodo along the northern ridge above the Irodo River, ca. 5 km E of Route Nationale 6 to Antsiranana (Diégo-Suarez), the nearest village Andranomena, Sarainana River, 12°37′S, 49°26′E, ca. 235 m, 26 Nov. 1992 (fl, fr), *D. J. Du Puy, G. Lewis & B. Schrire M564* (holotype, K; isotypes, P, MO, TAN). Figure 3.

Figure 2. *Millettia hitsika* Du Puy & Labat. —A. Habit. —B. Leaflet upper surface. —C. Leaflet lower surface. —D. Flower. —E. Calyx. (A–E drawn from *Service Forestier de Madagascar SF 20154.*)

Species *M. richardiana* affinis, inflorescentia elongata cum fasciculis pluribus florum, floribus minoribus, pedicellis multo brevioribus, et leguminibus glabris.

A shrub or small tree ca. 3–15 m tall, flowering on new shoots as they emerge from the buds and whilst the leaves are still very immature, DBH up to 40 cm; bark smooth with shallow vertical fissures, dark gray; young shoots densely golden pubescent; mature twigs glabrous, gray, with pale lenticels and large spherical dormant buds. Leaves with (13–)15–25 opposite leaflets; rachis slightly pubescent; stipels absent. Leaflets narrowly oblong-elliptic, 13–37 × 6–11 mm, with a long apical mucro (up to ca. 2 mm long), subcoriaceous and with decurved margins, densely golden pubescent when young, becoming glabrous when mature except for the midvein beneath. Pseudoracemes 1–3.5(–5.5) cm long, from the axils of very immature leaves, golden-velvety pubescent when still in flower, the axis often angular, the flowers in 1–3 clusters, often paired, but the bottom group may have 2–4 flowers; pedicels short, 2–4 mm long, with a pair of linear bracteoles ca. 3 mm long, which are caducous as the flowers open. Flowers 8–10 mm long, bright fuchsia pink fading to pale mauve, the standard pale green at the base. Calyx 4.5–5 mm long, pale pubescent with occasional brown hairs, purple, with 3 narrowly triangular lower teeth with slender, tapering tips, as long as or shorter than the calyx cup, and with 2 small, very closely spaced upper teeth. Standard limb ca. 6–8 × 8–10 mm, shallowly notched at the apex, white pubescent behind. Wings longer than the keel, both slightly pubescent on the outer surfaces. Staminal sheath ca. 7 mm long. Pod obovate to oblong, flat, 40–70 × 16–18 mm, tapering toward the base, rounded and with a decurved beak apically, glabrous, splitting into two woody valves with 1–3 seeds. Seeds disc-shaped, 8–9 × 8–9 mm, finely

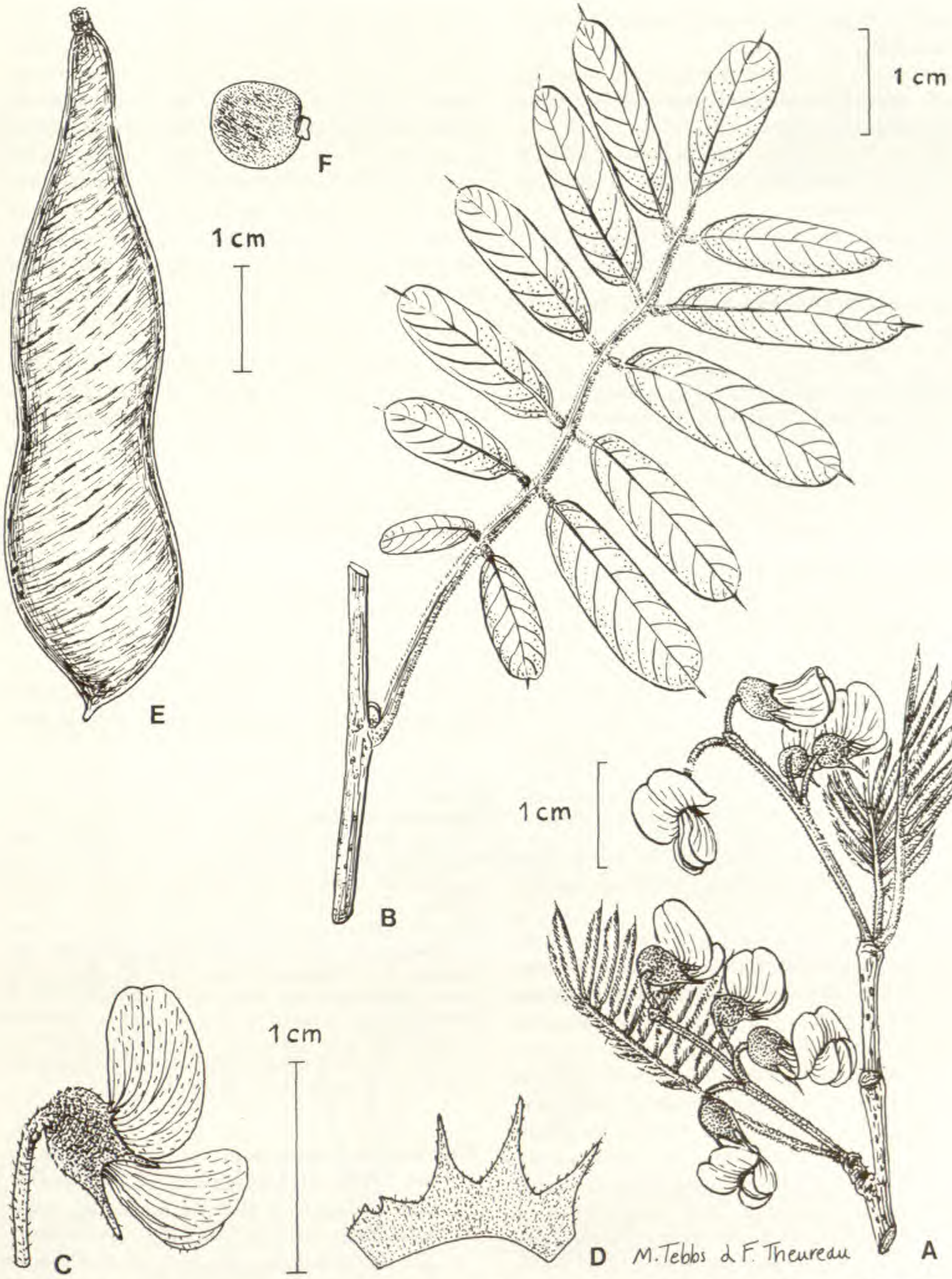


Figure 3. *Millettia nathaliae* Du Puy & Labat. —A. Flowering stem. —B. Leaf. —C. Flower. —D. Calyx. —E. Pod. —F. Seed. (A–F drawn from *Du Puy, Lewis & Schrire M564.*)

mottled dark brown, the aril extended into a short flap on one side.

*Millettia nathaliae* is closely related to *M. richardiana* but is distinguished by its elongated inflorescence with several clusters of flowers, its smaller flowers, its much shorter pedicels, and its glabrous pods. It also closely resembles *Pongamiopsis amygdalina* (Baillon) R. Viguier when in flower and before

the leaflets develop, but its much smaller flowers are characteristic.

*Distribution.* Northern Madagascar, Ankarana Massif, around Diégo-Suarez and Sahafary forest north of the Irodo River.

*Habitat.* In deciduous woodland and shrubland, especially on limestone, but also on sand, at ca. 200–250 m altitude.

*Flowering time.* Only recorded in November.

This species is dedicated to Nathalie Labat.

*Paratypes.* MADAGASCAR. Ankarana Massif, SE margin, about 25 km NE of Ambilobe, near the village of Ambilomagodro, 13°01′S, 49°07′E, 200 m, 17 Nov. 1992 (fl), *Du Puy, Lewis & Schrire M559* (K, MO, P, TAN); Forêt d'Andranomavo, Canton d'Anamakia, District de Diégo-Suarez, 24 Juin 1951 (fr), *Service Forestier de Madagascar 3596-SF* (K, P, TEF); Bassin de la Saharaina, forêt de Sahafary, 27 Nov. 1958 (fl), *Service Forestier de Madagascar 20112-SF, Capuron* (K, MO, P, TEF).

**Millettia orientalis** Du Puy & Labat, sp. nov. TYPE: E Madagascar. Baie d'Antongil, Nosy Mangabe, 5 km from Maroansetra, 15°33′S 49°46′E, 0–330 m, 9 Jan. 1989 (fl), *G. Schatz & J. Miller 2495* (holotype, MO; isotypes, K, P, TAN). Figure 4.

Species habitu robusto ramulis crassis et gemmis magnis, foliis longis (ca. 25–30 cm), foliolis numerosis (11–21) grandibus et inflorescentiis longis (9–20 cm) densis floribus numerosis grandibus (15–20 mm longis) distincta.

A large, deciduous tree ca. 15–30 m tall, flowering on new, developing shoots; [DBH not known]; young shoots densely velvety-pubescent, becoming glabrous and gray, the older twigs thick and blunt-ended with large, subspherical dormant buds. Stipules very large and conspicuous on emerging shoots, obovate, ca. 20–25 × 8–10 mm, soon caducous. Leaves large, ca. 25–30 cm long, with (11–)15–21 opposite or subopposite, subequal leaflets; rachis velvety-pubescent when young; stipels absent. Leaflets very large, oblong-elliptic to obovate, usually narrow, 60–110 × 20–35 mm, acuminate apically, obtuse to rounded basally, glabrous above, densely velvety beneath especially while young. Flowers in robust pseudoracemes 9–20 cm long from the axils of developing leaves near the base of new shoots, the flowers often paired and the lower ones on short secondary axes up to 5 mm long; pedicels with 2 slender, soon caducous bracteoles ca. 4 mm long. Flowers 15–20 mm long, pink fading to pale lavender or mauve, the standard green at the base, sweetly fragrant. Calyx 4–7 mm long, densely pubescent, purplish, with 3 broadly triangular lower teeth, the upper pair short and much reduced. Standard limb 11–15 × 12–14 mm, pubescent behind. Wings as long as the keel, finely pubescent outside. Staminal sheath 14–17 mm long, the free portion of the filaments rather long. Pods narrowly oblong to obovate, flat, ca. 70–150 × 20–30 mm, slightly thickened along both margins, velvety pubescent, splitting into 2 twisted, woody valves with 2–6 seeds. Seeds oblong to discoid, flat, 13–16 × 8–11 mm, chestnut brown, the aril extended into a short flap on one side.

*Millettia orientalis* is the only *Millettia* that forms a canopy tree in the humid eastern forests. It is characterized by its robust habit with thick twigs and large buds, its long leaves with many large leaflets, and its long, dense inflorescences with numerous large flowers.

*Distribution.* Known from around the Bay of Antongil and in the region of Taolañaro (Fort Dauphin).

*Habitat.* In lowland humid evergreen forest, up to ca. 300 m altitude.

*Flowering time.* October–January.

*Vernacular name.* Fanamoakondro.

The specific epithet indicates the provenance of this species, in the eastern forests of Madagascar.

*Paratypes.* MADAGASCAR. Prov. of Toliara, Fort Dauphin [Taolañaro] Region, NW of town near road to Andohahela Reserve, along trail W of road, 24°46′S, 46°53′E, 100–200 m, 11 Nov. 1989 (fl), *McPherson 14456* (K, MO, P, TAN); Emafotra, Mahatalaky, Fort Dauphin, 27 Mai 1954 (fr), *Service Forestier de Madagascar 10084-SF* (K, MO, P, TEF); Beandri, Mahatalaky, Fort Dauphin, 23 Oct. 1954 (st), *Service Forestier de Madagascar 11139-SF* (P, TEF); Amboangy, Mahatalaky, Fort Dauphin, 20 Oct. 1955 (fl), *Service Forestier de Madagascar 14861-SF* (K, MO, P, TEF); E Madagascar, environs de la Baie d'Antongil, massif de Farankaraina, entre Navana et Andranofotsy, 0–150 m, 16 Sep. 1957 (fr), *Service Forestier de Madagascar 18307-SF, Capuron* (K, P, TEF).

**Millettia taolanaroensis** Du Puy & Labat, sp. nov. TYPE: SE Madagascar. SW de Fort Dauphin [Taolañaro], Baie de Ranofotsy, colline près d'Italy, 10 Jan. 1963 (fl), *Service Forestier de Madagascar 22367-SF, R. Capuron* (holotype, P; isotypes, K, MO, P, TEF, WAG). Figure 5.

Species foliolis subglabris nitidis obtusis ad rotundatis subtus cinerascentibus, pubescentia aperta pilis nitidis cupreis brevibus praesertim in rachidi, petiolulis, axe inflorescentiae, pedicellis et calycibus, et leguminibus glabris secus marginem superiorem incrassatis distincta.

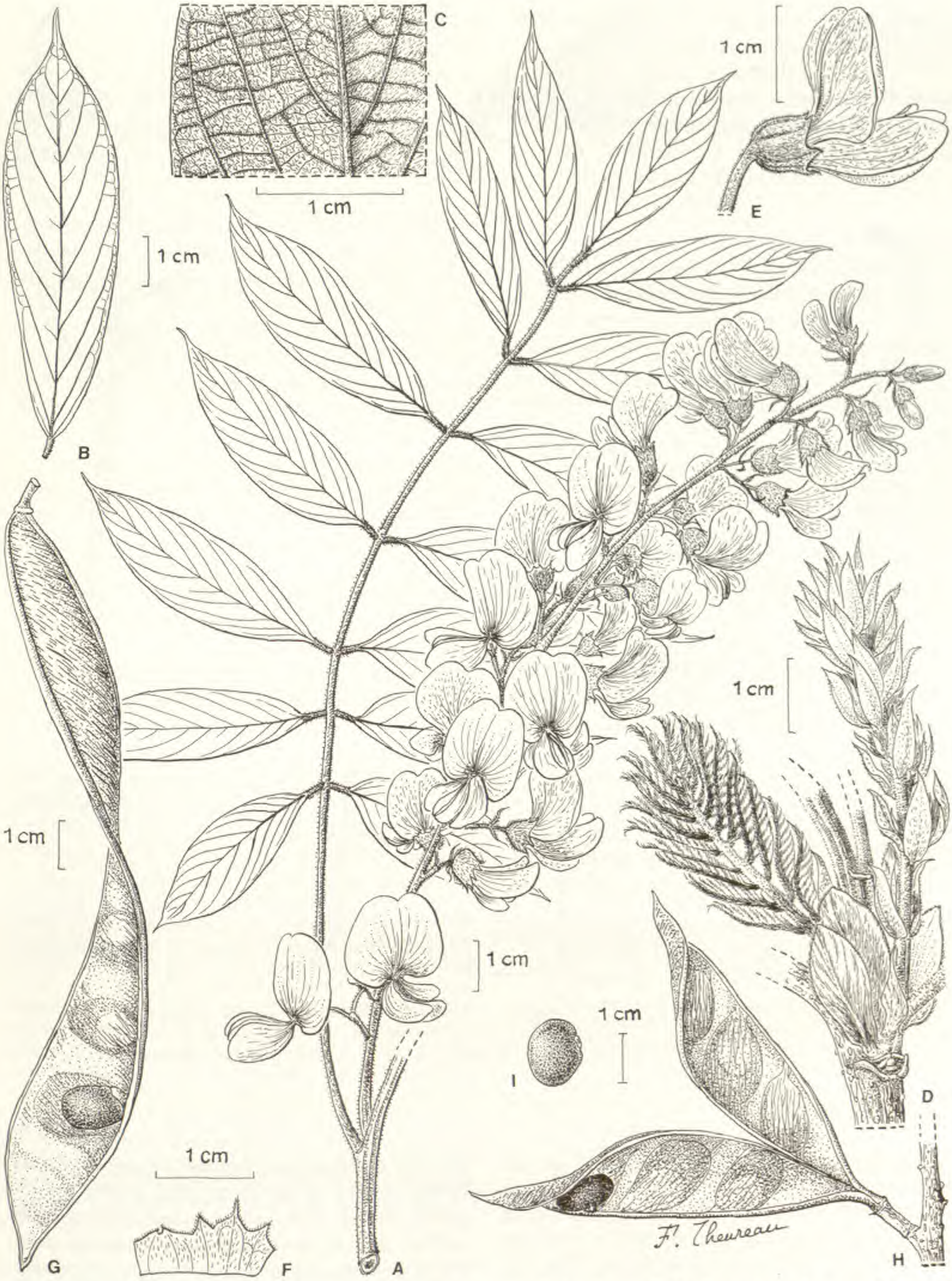


Figure 4. *Millettia orientalis* Du Puy & Labat. —A. Habit. —B. Leaflet. —C. Leaflet undersurface. —D. Young stem with stipules, leaf and inflorescence. —E. Flower. —F. Calyx. —G, H. Pod. —I. Seed. (A, E, and F drawn from *Schatz & Miller 2495*; B and C from *Service Forestier de Madagascar SF 18307*; D from *Service Forestier de Madagascar SF 11139*; G–I from *Service Forestier de Madagascar SF 10084*.)

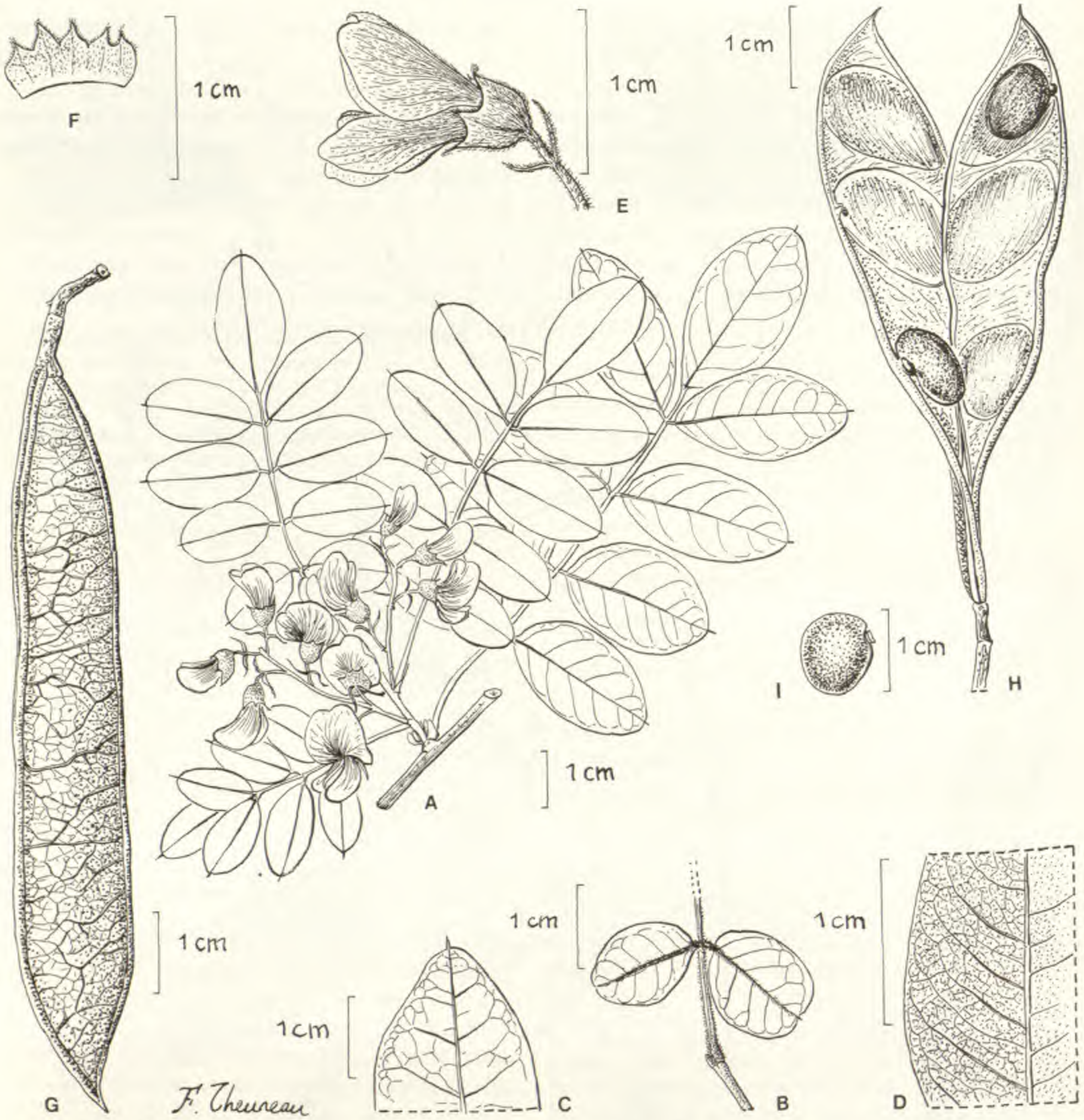


Figure 5. *Millettia taolanaroensis* Du Puy & Labat. —A. Habit. —B. Petiole and first leaflet pair. —C. Leaflet apex. —D. Leaflet undersurface. —E. Flower. —F. Calyx. —G, H. Pod. —I. Seed. (A, C–F drawn from *Service Forestier de Madagascar SF 22367*; B and G from *Phillipson & Milijaona 3526*; H and I from *Service Forestier de Madagascar SF 8503*.)

A deciduous shrub or small tree 4–6 m tall, flowering on young shoots with fully expanded leaves; twigs sparsely pubescent when young, glabrescent, with small dormant buds. Leaves with 7–11 opposite leaflets; rachis thinly coppery-pubescent; stipels absent. Leaflets elliptic, 12–30(–36) × 9–19 mm, rounded basally, obtuse or rounded to notched and mucronulate apically, dark green, glossy and glabrous above, gray-green and almost glabrous with very scattered, short brown hairs beneath. Flowers in delicate pseudoracemes ca. 4–6 cm long from the axils of leaves near the base of new shoots, the flowers solitary or paired on small knobs; pedicels with 2 slender, soon caducous bracteoles near the middle. Flowers 10–12 mm long, mauve or violet. Calyx 3–4 mm long, densely coppery-pubescent, with 5 short, broadly triangular teeth, the upper pair smallest and close together. Standard limb ca. 9 × 9 mm, cuneate basally, finely pubescent behind. Wings as long as the keel. Staminal sheath ca. 8 mm long. Pods obovate to oblong, flat, (40–)50–90 × (12–)14–19 mm, tapering basally, the apex

rounded and beaked, slightly thickened along the upper margin, glabrous or with very scattered brown hairs, splitting into 2 twisted, woody valves, with 1–5 (usually 1–3) seeds. Seeds oblong-discoid, 9–10 × 7–8 mm, chestnut brown, the aril extended into a small flap on one side.

*Millettia taolanaroensis* is recognizable by its subglabrous, glossy, obtuse to rounded leaflets, which are grayish beneath, by its thin pubescence of lustrous, copper-colored short hairs most noticeable on the leaf rachis and petiolules, the inflorescence axis and pedicels and the calyces, and by its glabrous pods thickened along the upper margin. It appears to flower when the leaves are almost full-sized rather than as new growth emerges from the buds.

*Distribution.* Southeastern Madagascar, only known from around Taolañaro (Fort Dauphin), on the coastal plains to the north and on the lower slopes of the mountains to the west (including Andohahela, parcelle 3).

*Habitat.* In coastal, evergreen forest on sand, and in transitional, deciduous woodland often near the coast.

*Flowering time.* Only recorded in January.

*Local uses.* Used as a fish poison.

*Vernacular name.* Anakaraka.

The specific epithet indicates the provenance of this species, in the southern region of Madagascar, near the town of Taolañaro.

*Paratypes.* MADAGASCAR. Maravato près de Fort Dauphin, Avr. 1972 (fr), *Boiteau s.n.* (P); Prov. de Fort Dauphin, Andrahomana, 24 Juin 1926 (fr), *Decary 3993* (P); Baie des Galions (Ranofotsy) au SW de Fort Dauphin, 1–100 m, 18–21 Fév. 1955 (fr), *Humbert & Capuron 29019* (L, MO, P); Falaise cotière NW du Cap Sainte-Marie, vers Lavanono, 1–150 m, 8 Mar. 1955 (fr), *Humbert & Capuron 29323* (K, P); Fort Dauphin region, W of town along highway on southern boundary of Réserve Integrale no. 11, Andohahela, parcel 3, dry forest W of Col des Ranopiso, 120–140 m, 27 Jan. 1990 (fr), *McPherson & Pigeon 14911* (K, MO, P, TAN); 5 km S of Manambaro, 23 km W of Fort Dauphin, 25°05′S, 46°49′E, 150 m, 30 Mar. 1991 (fr), *Miller & Randrianasolo 6224* (K, MO, P, TAN); Réserve d'Andohahela, parcelle 3, 25°02′S, 46°40′E, 100 m, 17 Feb. 1990 (fr), *Phillipson & Milijaona 3526* (K, MO, P, TAN); Préfecture de Fort Dauphin, Petriky, 25°05′S, 46°51′E, 0–10 m, 16 Oct. 1989 (fr), *Rabevohitra 2018* (K, MO, P, TAN); Mandena, Fort Dauphin, 8 Avr. 1953 (fr), *Service Forestier de Madagascar 8172-SF* (P, TEF); Bords d'un cours d'eau, aux environs de Ranopiso, route Ambovombe–Fort Dauphin, 23 Sep. 1953 (fr), *Service Forestier de Madagascar 8503-SF, Capuron* (K, MO, P, TEF); entre km 454 et 455 de la route de Fort Dauphin, 19 Sep. 1954 (fr), *Service Forestier de Madagascar 10911-SF* (P, TEF).

**Millettia aurea** (R. Viguier) Du Puy & Labat, comb. nov. Basionym: *Neodunnia aurea* R. Viguier, Notul. Syst. (Paris) 14: 73, 1950. TYPE: (based on three collections) W Madagascar. Ambongo, Manongarivo [S of Soalala], Oct. 1903 (fl, jfr), *H. Perrier de la Bâthie 1617* (lectotype, chosen here, P; isolectotypes, K, L, MO, P, TAN).

R. Viguier cited three syntypes in the original description, including *H. Perrier de la Bâthie 4831* and *4879*, in addition to the lectotype selected here.

*Millettia aurea* may be confused with *M. richardiana*, which differs in its much shorter inflorescences with a single cluster of (larger) flowers, its smaller and less pubescent calyx with shorter teeth, especially the upper pair, which are very short and connate to near the tip, its much less pubescent petals, and its usually smaller leaflets.

*Millettia aurea* is an uncommon species of western Madagascar, with a restricted distribution in the Boina and the Ambongo, south to Maintirano, most frequently recorded from the region of Ankarafantsika, and from Soalala to Mitsinjo. It occurs in deciduous woodland, on sand, often near the coast but also inland at up to ca. 300 m altitude.

**Millettia richardiana** (Baillon) Du Puy & Labat, comb. nov. Basionym: *Mundulea richardiana* Baillon, Bull. Soc. Linn. Paris 1: 389–390, 1883, pro parte. TYPE: (based on three collections) N Madagascar. [Diégo-Suarez (Antsiranana)], Baie des Amis (fl), *C. Richard 158* (lectotype, chosen here, P).

*Mundulea hysterantha* Baker, J. Linn. Soc., Bot. 25: 309, 1890. Syn. nov. TYPE: W Madagascar. Androna (fl, jfr), *R. Baron 5444* (holotype, K; isotype, P).

*Millettia baroni* Drake in Grandidier, Hist. Phys. Nat. Pol. Madagascar, Plantes, Texte 1: 141, 1903. Syn. nov. TYPE: Madagascar (fr), *R. Baron* 4952 (holotype, P; isotypes, K, P).

*Neodunnia atrocyanea* R. Viguier, Notul. Syst. (Paris) 14: 72, 1950. Syn. nov. TYPE: NW Madagascar. Rivière de Mananjeba, Oct. 1909 (fl), *H. Perrier de la Bâthie 4845* (holotype, P; isotype, P).

*Neodunnia edentata* R. Viguier, Notul. Syst. (Paris) 14: 73, 1950, pro parte. Syn. nov. TYPE: (based on four collections) NW Madagascar. Majunga, Dec. 1924 (fl), *H. Perrier de la Bâthie 16800* (lectotype, chosen here, P; isolectotypes, K, P, MO).

H. Baillon cited three syntypes in the original description of *Mundulea richardiana*, including *Boivin 2712* and *2713*, in addition to the lectotype selected here. Of the two *Boivin* specimens (both mounted on the same herbarium sheet) only *2712*

corresponds with *M. richardiana*; *Boivin 2713* is *Pongamiopsis amygdalina* (Baillon) R. Viguier.

In the original description of *Neodunnia edentata*, R. Viguier cited four syntypes: *H. Perrier de la Bâthie 1601* is a specimen of *Pongamiopsis pervilleana* (Baillon) R. Viguier; *H. Perrier de la Bâthie 4076*, *16800*, and *Louvel 53* are all specimens of *Millettia richardiana*. *H. Perrier de la Bâthie 16800* is composed of two elements: the first was collected in December 1924, in flower, and is selected here as the lectotype; the second was collected in January 1926, in fruit, and is considered here to be a separate specimen.

*Millettia richardiana* is especially variable in the number of leaflets, the form and pubescence of the leaflets, and the pubescence of the pods. Variants can be constant within certain localities. However, none of these variants seem distinct enough to be recognized as separate taxa.

*Millettia richardiana* is very widely distributed throughout western Madagascar from Antsiranana (Diégo-Suarez) to Toliara (Tulear) and southwestern Madagascar, including the forest of Zombitsy, the Bemaraha Massif, the Ambongo, the Boina and the Ankarana Massif. It occurs in deciduous woodland, mainly on calcareous or sandy soils, on limestone, sand over limestone or on coastal dunes, at up to ca. 300 m altitude.

**Pongamiopsis viguieri** Du Puy & Labat, sp. nov. TYPE: W Madagascar. Tsingy de Bemaraha (Réserve Naturelle no. 9), environs d'Antsalova, 5 km à l'E de Bevitika, 18°38′S, 44°43′E, 150–250 m, 30 Nov. 1992 (fr), *J.-N. Labat, R. Edmond & O. Laivao 2243* (holotype, P; isotypes, K, MO, P, TAN). Figure 6.

A *P. amygdalina* differt inflorescentiis brevibus condensatis, dentibus calycis latioribus, apicibus tenuibus destitutis, vexillo, alis et carina dense pubescentibus, vagina staminea breviori, et leguminibus plerumque elongatioribus seminibus numerosioribus.

A deciduous tree (2–4–)10 m tall, flowering on new shoots as they emerge from the buds and whilst the leaves are still very immature; young shoots densely pubescent, glabrescent; twigs with large leaf scars and large, spherical dormant buds. Leaves becoming very large, with 7–11 opposite leaflets; stipels absent. Leaflets oblong, oblong-elliptic or oblong-obovate, 50–200 × 20–80 mm, with a broad, V-shaped apical notch with a mucro at the base of the notch, silky pubescent at first but becoming glabrous above and pubescent mainly on the veins beneath, the veins strongly raised beneath, the straight, parallel secondary veins extending to the slightly thickened margin. Racemes produced in the axils of the lowest leaves of developing shoots, short and condensed, the axis ca. 1–3 cm long, with numerous flowers in closely spaced clusters of 2 or 3 on short spurs; pedicels with a pair of small, caducous bracts toward the apex. Flowers 13–15 mm long, white washed with pale lilac, the standard with a pale green basal eye. Calyx 6–8 mm long, densely appressed-hairy, with 3 triangular, acute lower teeth, the upper pair partially connate but with free, widely separated, recurved tips. Standard limb 12–14 × 12–13 mm, densely silky pubescent behind. Wings about as long as the keel, narrow, both appressed-pubescent outside and upcurved apically, the keel shortly beaked. Staminal sheath 12–15 mm long. Style short-hairy, hooked apically. Pod strongly inflated, ellipsoidal to oblong-ellipsoidal, 45–70 × 25–35 × 23–35 mm, obliquely beaked apically, the upper margin broad and thickened, velvety-pubescent, wrinkled, thick and woody, indehiscent or eventually splitting into 2 valves, usually with 3–5 seeds (occasionally some pods with fewer seeds). Seeds subspherical, compressed, ca. 13 mm diam., becoming dark gray, the hilum raised and surrounded by a narrow aril.

*Pongamiopsis viguieri* is closely related to *P. amygdalina*, with similar leaves, pod type, and growth habit, but differs in its short, condensed inflorescences, its broader calyx teeth lacking the very slender tips, its densely pubescent standard, wings, and keel, its shorter staminal sheath, and its usually more elongated pods with more numerous seeds. It occurs in western rather than northern Madagascar, which is the range of *P. amygdalina*.

*Distribution.* Western Madagascar, uncommon, mainly from the Bemaraha Massif, but also collected at Amboanio south of Mahajanga (Majunga) and at Andranomavo near Namoroka.

*Habitat.* In deciduous woodland, always over limestone outcrops or "tsingy," from near sea level to ca. 500 m altitude.

*Flowering time.* October.

This species is dedicated to René Viguier, in recognition of his extensive research on the Leguminosae of Madagascar.

*Paratypes.* MADAGASCAR. Vallée de la Tsiribihina dans le Bemaraha, 20–350 m, Oct. 1933 (fl, jfr), *Humbert 11480* (K, MO, P); Antsingy de Bemaraha, vers Anbodiriana (E d'Antsalova), NE du pont, 100–150 m, 10 Déc. 1952 (fr), *Leandri, Capuron & Razafindrakoto 2102* (BR, K, L, MO, NY, P, PRE, WAG); Antsingy de Bemaraha, vers Anbodiriana (E d'Antsalova), 100–150 m, 21–27 Jan. & 8–11 Fév. 1960 (fr), *Leandri & Saboureau 3071* (K, L, MO, NY, P, PRE); Ambongo, environs d'Andranomavo, Jan. 1905 (jfr), *Perrier de la*

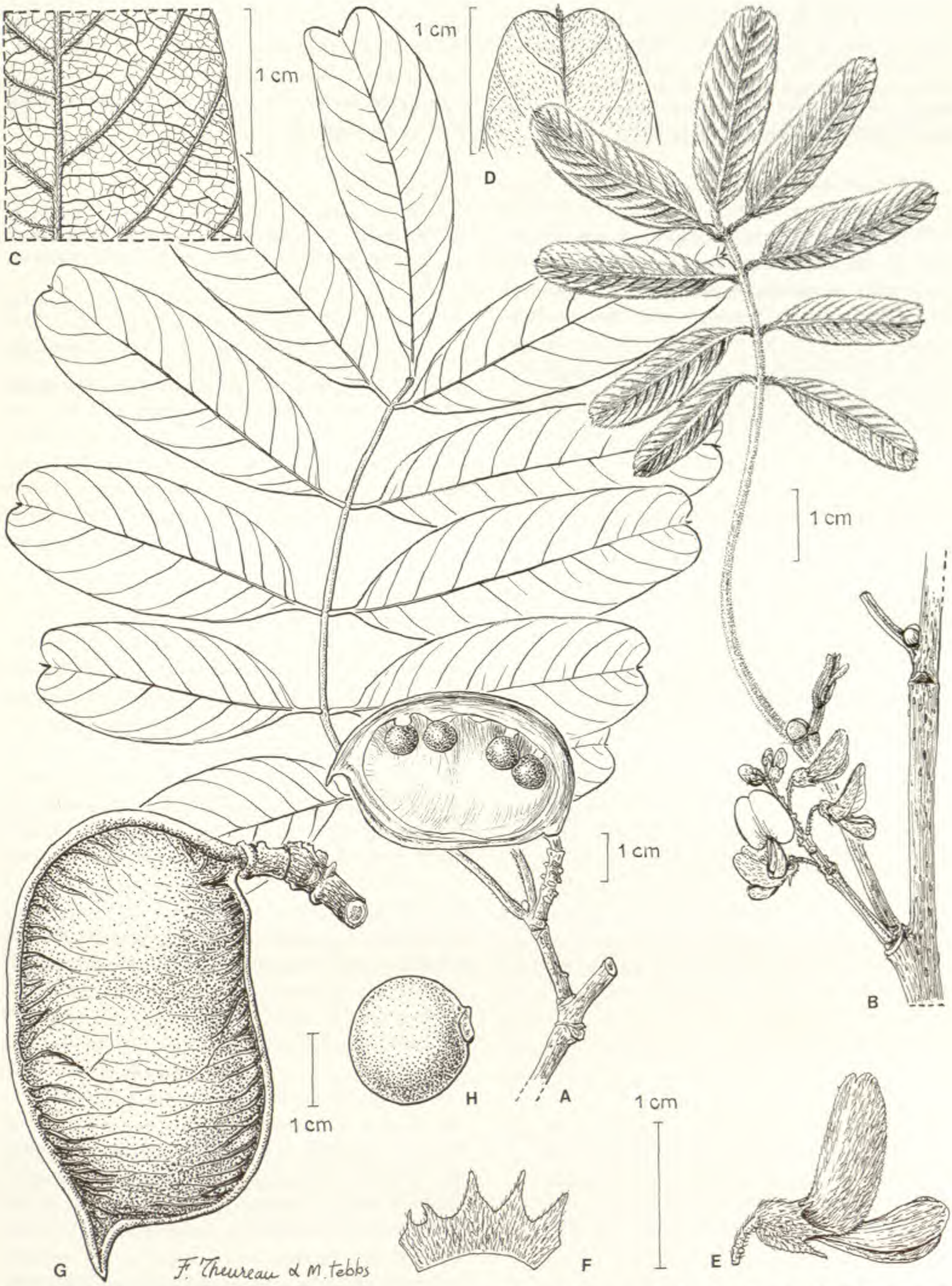


Figure 6. *Pongamiopsis viguieri* Du Puy & Labat. —A. Habit with mature leaf and pod. —B. Habit with young leaf and flowers. —C. Leaflet undersurface. —D. Leaflet apex. —E. Flower. —F. Calyx. —G. Pod. —H. Seed. (A, C, and D drawn from *Labat, Edmond & Laivao 2243*; B, E, and F drawn from *Humbert 11480*; G and H from *Leandri & Saboureau 3071*.)

*Bâthie 1801* (P); Rochers calcaires du bord de mer à Amboanio près de Majunga, Fév. 1901 (fr), *Perrier de la Bâthie 1828* (P); Antsingy de Bemaraha, route Antsalova–Tsiandro, aux environs de la clairière d'Ambodiriana, 10 Déc. 1952 (fr), *Service Forestier de Madagascar 6808-SF, Capuron* (K, L, MO, P, TEF).

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Literature Cited

Geesink, R. 1981. Tephrosieae. Pp. 245–260 *in* R. M. Polhill & P. H. Raven (editors), Advances in Legume Systematics, Part 1. Royal Botanic Gardens, Kew.

———. 1984. Scala Millettiearum. A survey of the genera of the tribe Millettieae (Legum.–Pap.) with methodological considerations. E. J. Brill/Leiden Univ. Press, Leiden Botanical Series 8.

Hutchinson, J. 1964. The Genera of Flowering Plants. Vol. 1. Oxford Univ. Press, Oxford.

# Another New, Nearly Extinct Species of *Hibiscadelphus* (Malvaceae) from the Hawaiian Islands

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ABSTRACT. Four individuals of a new species of *Hibiscadelphus* (Malvaceae: Hibisceae) have been discovered on Kaua'i, the oldest of the major Hawaiian Islands. *Hibiscadelphus woodii* is described and illustrated, and its status and basal relationship within the genus are discussed. The imperiled status of the other six species is reviewed, and a key to the genus is given.

*Hibiscadelphus* Rock consists of seven species endemic to the Hawaiian Islands (Bates, 1990), including the one described herein. The genus was originally established by Joseph F. Rock (Radlkoffer & Rock, 1911) to accommodate three species of shrubs or small trees that he had collected from dryland forests: two species on the island of Hawai'i, *H. giffardianus* Rock (Mauna Loa) and *H. hualalaiensis* Rock (Hualalai), and *H. wilderianus* Rock from Auwahi on East Maui. Four additional species were subsequently described: *H. bombycinus* C. Forbes from the Kohala Mountains on the island of Hawai'i (Forbes, 1920), *H. distans* L. Bishop & Herbst from the Koai'e Canyon of Kaua'i (Bishop & Herbst, 1973), *H. crucibracteatus* Hobdy from Puhielelu Ridge on Lana'i (Hobdy, 1984), and the new species, *H. woodii*, described herein from Kalalau Valley, Kaua'i.

*Hibiscadelphus* is a member of the tribe Hibisceae, represented in the Hawaiian Islands by the indigenous genus *Hibiscus* L., following Fryxell's (1968) classification. Although closely related to *Hibiscus* (the generic name means "brother of *Hibiscus*"), *Hibiscadelphus* is clearly a distinct monophyletic group based on its curved and narrowly convolute zygomorphic corollas with the lower two lobes shorter than the other three, calyces that are circumscissily deciduous in fruit, and relatively thick, woody capsules (Hobdy, 1984; Bates, 1990). The green, yellow, or magenta flowers with tubular, curved corollas are presumably adapted to pollination by native Meliphagid and Drepanidine birds, known as the honeyeaters and honeycreepers (Hobdy, 1984). The Hawaiian name for members of the genus is *hau kuahiwi*, meaning upland or mountain hau, because of their resemblance to the common lowland hau, *Hibiscus tiliaceus* L. (Rock, 1913; Bates, 1990).

Due to the destruction and severe alteration of the diverse dry and mesic forest habitats and loss of all of the Meliphagid birds in the Hawaiian Islands (Hobdy, 1984), five of the seven *Hibiscadelphus* species have become extinct in the wild, although at least two of these are maintained through cultivated plants: *H. giffardianus* and *H. hualalaiensis*. Only *H. distans*, a U.S. federally listed endangered species, and the new species described in this paper have naturally occurring wild populations (Table 1; Bates, 1990). The status of the genus is extremely precarious at present.

In March 1991 an unusual species of *Hibiscadelphus* not corresponding with any of the described taxa was discovered on Kaua'i by Kenneth R. Wood, staff member of the National Tropical Botanical Garden, along with M. Query and S. Montgomery. Four plants were found growing on a steep slope below the rim of Kalalau Valley in northwestern Kaua'i (K. R. Wood, 1992, unpublished). Study of flowering specimens has revealed that they represent a new species.

**Hibiscadelphus woodii** Lorence & W. L. Wagner, sp. nov. TYPE: Hawaiian Islands. Kaua'i: Hanalei District, Kalalau Rim, N of Kahuama'a Flat, steep diverse lowland mesic forest, 990–1020 m, 3 Mar. 1991, *K. R. Wood, M. Query & S. Montgomery 629* (holotype, PTBG, a flower also in spirit collection; isotypes, BISH, K, MO, NY, US). Figure 1.

Species foliis glabratis vel venis sparsim stellato-puberulis, pagina abaxiali laminae axillis venarum trichomatibus stellatis instructis, calyce trichomatibus stellatis cum radiis 5–8 ornatis, corolla cerina cupreo-suffusa atropurpurescentia distinguibilis.

Table 1. Status of species of *Hibiscadelphus* (D. Ragone, unpublished observations, 1993). DOFAW = Division of Forestry and Wildlife, Department of Land and Natural Resources, State of Hawaii (plantings at Pu'uwa'awa'a, Kona, Hawai'i Island); HVNP = Hawaii Volcanoes National Park (planting at Kipuka Puaulu, Hawai'i Island); NTBG = National Tropical Botanical Garden (plantings at Lawai and Limahuli Gardens, Kaua'i); WA = Waimea Arboretum (plantings at Haleiwa, O'ahu).

| Species | Distribution | Wild populations | Known individuals | |
|---|---|---|---|---|
| | | | Wild | Cultivated |
| *H. bombycinus* | Hawai'i (Kohala Mts.) | Extinct | — | — |
| *H. crucibracteatus* | Lana'i (Puhielelu Ridge) | Extinct | — | — |
| *H. distans* | Kaua'i (Koai'e Canyon) | 2 | 137 | 39 NTBG<br>14 WA |
| *H. giffardianus* | Hawai'i (Mauna Loa) | Extinct | — | 7 HVNP<br>1 NTBG<br>8WA |
| *H. hualalaiensis* | Hawai'i (Hualalai) | Extinct | — | 3 NTBG<br>20–30 DOFAW |
| *H. wilderianus* | East Maui (Auwahi) | Extinct | — | — |
| *H. woodii* | Kaua'i (Kalalau Valley) | 1 | 4 | — |

Small branched trees 2.5–5 m tall with dense rounded crown, trunk with DBH 10–20 cm, the twigs glabrate. Leaves with petioles 2.8–5.8 cm long bearing scattered stellate trichomes when young, glabrate; stipules subulate, 3–5 mm long, sparsely stellate-pubescent; blade broadly ovate to very broadly ovate, 7–9 cm long, 6.5–8.4 cm wide, thin-coriaceous, drying chartaceous; adaxially glabrate or with scattered small, translucent stellate trichomes on principal veins, abaxially with few scattered stellate trichomes on principal veins or glabrate, with sparse tufts of stellate trichomes in major vein axils, when young with scattered stellate trichomes along margins and at junction with petiole, the base deeply cordate, occasionally shallowly so, the apex acute to weakly acuminate or broadly obtuse, the principal veins 5 (7), the margins irregularly and coarsely crenate-dentate. Flowers solitary, the peduncles 1.4–2.1 cm long, sparsely stellate pubescent; involucral bracts 4–6, free essentially to their base, 11–15 mm long, 1.8–4 mm wide, linear-oblong; calyx tubular, 1.3–1.5 cm long (up to 1.7 cm when fresh), green, shallowly 5-lobed, the lobes 2–3 mm long, sometimes in age splitting further, moderately densely pubescent with stellate trichomes composed of 5–9 horizontal radiating arms free to their base; corolla 45–47 mm long, stellate pubescent, yellow with coppery tinge when fresh, rapidly becoming purplish maroon, the lobes 35–40 mm long, 10–12 mm wide, with conspicuous veins, moderately stellate pubescent with trichomes becoming restricted to veins in inner ⅓ of lobes abaxially; staminal column exserted ca. 7 mm beyond corolla lobes, stigmas ca. 1 mm long, subglobose, reddish brown, villosulous, exserted 14 mm beyond corolla lobes; style villous; ovary 7 mm long, 4–5 mm wide, 5-angled, stellate pubescent, endocarp segments apparently 10 (in cross section). Fruit unknown.

*Distribution and habitat.* The new species is known only from a population of four trees at the type locality—accessible only with climbing ropes. It occurs on a steep slope of predominantly basalt talus with patches of brown soil and leaf litter in remnant diverse lowland mesic forest. Associated native taxa include *Melicope pallida* (Hillebrand) T. Hartley & B. Stone, *Nototrichium* sp. nov., *Hedyotis* sp. nov., *Chamaesyce* sp. nov., *Lysimachia glutinosa* Rock, *L. kalalauensis* Skottsberg, *Poa mannii* Munro ex Hillebrand, *Stenogyne campanulata* Weller & Sakai, and *Lobelia niihauensis* St. John. The alien daisy fleabane, *Erigeron karvinskianus* DC., is an extremely invasive perennial herb that threatens to overrun and smother the native cliff habitat in this region. Accessible areas above these cliffs have been severely degraded by feral goats and pigs. The *Hibiscadelphus woodii* plants are also susceptible to damage by falling rocks dislodged by these animals, which aggravate erosion.

*Reproduction and conservation.* Flowering material has been collected in March, April, and Sep-

Figure 1. *Hibiscadelphus woodii* Lorence & W. L. Wagner. Habit. Scale = 1 cm.

tember, but no fruit set has been observed in spite of efforts to manually outcross and bag the flowers. Introduced birds, i.e., the Japanese white eye (*Zosterops japonicus*), were seen piercing the corollas above the calyx, presumably robbing nectar (note on *Wood et al. 640*). A liquid-preserved flower of *Wood 726* contained three adult Nitidulidae beetles probably representing an endemic species (D. Jamieson, pers. comm.). The flower also contained two half-grown larvae of the endemic moth *Crocidosema marcidella* (Walsingham) (Lepidoptera: Tortricidae), which had completely eaten the style down to the ovary. Larvae of Hawaiian *Crocidosema* species are known to feed on indigenous Malvaceae fruits and foliage (Zimmerman, 1978), and damage by these larvae may be responsible for the observed

lack of fruit set in *H. woodii*. Attempts to propagate the new species by air layering, cuttings, grafts, and tissue culture thus far have failed.

We take pleasure in naming this new species for Kenneth R. Wood, in recognition of his continued efforts to understand and protect the rare and endangered plants of the Hawaiian Islands, especially those of Kalalau Valley.

*Paratypes.* HAWAIIAN ISLANDS. **Kaua'i:** Hanalei District, Kalalau Rim, N of Kahuama'a Flat, steep diverse lowland mesic forest, 990–1000 m, 6 Mar. 1991, *K. R. Wood et al. 640* (BH), 15 Apr. 1991, *K. R. Wood et al. 726* (PTBG), 23 Sep. 1991, *K. R. Wood & S. Perlman 1600* (PTBG).

*Affinities.* *Hibiscadelphus woodii* differs from its congeners in having leaves that are glabrate except for rare stellate trichomes adaxially and sparse stellate trichomes on the veins and in the principal vein axils abaxially, stellate trichomes on the calyx with rays free to the base, and yellow corollas with a coppery tinge, rapidly becoming purplish maroon with age. *Hibiscadelphus distans* differs in its involucral bracts connate for about one-third of their length, multi-rayed calyx trichomes of two sizes, a smaller yellowish green corolla rapidly becoming dull reddish, and densely stellate pubescence on the corolla with the trichomes becoming restricted to the veins on the inner one-third of the lobes abaxially. *Hibiscadelphus giffardianus* differs from *H. woodii* in having filiform involucral bracts up to 1.1 mm wide, whereas those of *H. hualalaiensis* are short, triangular teeth only 0.5–3 mm long. *Hibiscadelphus crucibracteatus* differs in having longer involucral bracts (20–30 mm), whereas *H. wilderianus* has a longer calyx (2.3–2.5 cm). *Hibiscadelphus bombycinus* differs from *H. woodii* in having leaves with the lamina densely pubescent beneath and a shorter corolla (3.3 cm). Fruiting material, unknown for *H. woodii*, is required to further assess its affinities. Examination of transverse hand-cut sections of a flowering ovary of *H. woodii* suggests the endocarp will separate into ten segments in fruit as in *H. bombycinus*, *H. crucibracteatus*, *H. giffardianus*, *H. hualalaiensis*, and *H. wilderianus*, rather than into five boat-shaped segments as in *H. distans*.

The phylogenetic relationships of this unique Hawaiian endemic genus were recently analyzed (Funk & Wagner, 1995). In the single cladogram resulting from their morphological study the position occupied by *Hibiscadelphus woodii* is basal. Because fruit characters are among the most important ones for determining the tree topology, the placement of *H. woodii* is in doubt. Their analysis estimated that the fruit character of *H. woodii* is plesiomorphic (i.e., chartaceous, not woody) as in *H. distans*. In order to investigate the stability of the basal position of *H. woodii* in the phylogeny they recoded the missing character as apomorphic. Even with this change, however, *H. woodii* remained in the basal position. Species of *Hibiscadelphus* may be separated by characters given in the following key (adapted from Bates, 1990).

KEY TO THE SPECIES OF *HIBISCADELPHUS*

1a. Involucral bracts connate ca. ⅓ of their length; mesocarp weakly developed and usually adnate to exocarp; endocarp segments 5, boatlike; Koai'e Canyon, Kaua'i ..... *H. distans*
1b. Involucral bracts free or connate slightly at base; reticulate mesocarp strongly developed; endocarp segments 10.
  2a. Involucral bracts filiform or obsolete, up to 1.1 mm wide.
    3a. Involucral bracts 0.5–2(–3) mm long; corolla yellowish green, fading to purplish within, 2–5(–5.5) cm long; Hualalai, Hawai'i ..... *H. hualalaiensis*
    3b. Involucral bracts 18–35 mm long (hybrids between *H. giffardianus* and other species tend to have bracts 5–15 mm long); corolla grayish green externally, dark magenta within, (5–)6–7 cm long; Mauna Loa, Hawai'i ..... *H. giffardianus*
  2b. Involucral bracts linear to spatulate, 1–7 mm wide.
    4a. Involucral bracts 20–30 mm long, 3–7 mm wide; calyx 4.2–4.9 cm long; corolla 5–6.5 cm long; Puhielelu Ridge, Lana'i ..... *H. crucibracteatus*
    4b. Involucral bracts 9–18 mm long, 1.5–4 mm wide; calyx 1.3–2.5 cm long; corolla 3.3–4.7 cm long.
      5a. Leaf lamina adaxially glabrate or with minute, scattered, stellate trichomes only on principal veins, abaxially glabrate or with scattered stellate trichomes only on principal veins, the trichomes sparsely tufted in principal vein axils; Kalalau Valley, Kaua'i ..... *H. woodii*
      5b. Leaf lamina adaxially sparsely stellate pubescent, abaxially sparsely to densely stellate pubescent, the trichomes densely tufted in principal vein axils; Mauai, Hawai'i.
        6a. Involucral bracts 9–10 mm long; calyx ca. 1.2 cm long; Kohala Mts., Hawai'i ..... *H. bombycinus*
        6b. Involucral bracts 11–18 mm long; calyx 2.3–2.5 cm long; Auwahi, East Maui ..... *H. wilderianus*

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Literature Cited

Bates, D. M. 1990. Malvaceae. Pp. 868–903 *in* W. L. Wagner, D. R. Herbst & S. H. Sohmer, Manual of the Flowering Plants of Hawai'i. Univ. Hawaii Press & Bishop Museum Press, Honolulu.

Bishop, L. E. & D. R. Herbst. 1973. A new *Hibiscadelphus* (Malvaceae) from Kauai. Brittonia 25: 290–293.

Forbes, C. N. 1920. New Hawaiian plants. Occas. Pap. Bernice Pauahi Bishop Mus. 7(3): 33–39.

Fryxell, P. A. 1968. A redefinition of the tribe Gossypieae. Bot. Gaz. 129: 296–308.

Funk, V. A. & W. L. Wagner. 1995. Biogeography of seven ancient Hawaiian plant lineages. *In:* W. L. Wagner & V. A. Funk (editors), Hawaiian Biogeography: Evolution on a Hot Spot Archipelago. Smithsonian Institution Press, Washington, D.C.

Hobdy, R. W. 1984. A re-evaluation of the genus *Hibiscadelphus* (Malvaceae) and the description of a new species. Occas. Pap. Bernice P. Bishop Mus. 25(11): 1–7.

Radlkoffer, L. & J. F. Rock. 1911. New and noteworthy Hawaiian plants. Hawaiian Board of Agriculture and Forestry Botanical Bull. 1: 1–15.

Rock, J. F. 1913. The Indigenous Trees of the Hawaiian Islands. Charles E. Tuttle, Rutland, Vermont.

Wood, K. R. 1992. New *Hibiscadelphus* found on Kauai. Hawaii's Forests and Wildlife 7(1): 15–117.

Zimmerman, E. C. 1978. Insects of Hawaii. Vol. 9, Microlepidoptera, Part 1. The Univ. Press of Hawaii, Honolulu, Hawaii.

# A New Species of *Tournefortia* (Boraginaceae) from La Planada, Colombia

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ABSTRACT. *Tournefortia restrepoae* J. S. Miller, sp. nov., is described from the Reserva Natural La Planada in Nariño, Colombia. The species is distinct in its evidently and evenly pustulate leaf surface with depressed tertiary venation and elevated areoles, and in its widely separated petiolate flowers. It is currently known only from the type locality.

The genus *Tournefortia* comprises about 150 species distributed throughout tropical and subtropical parts of the world (Miller, 1988). The vast majority of the species occur in the Neotropics, and the genus is only sparsely represented in the Old World. South America, particularly the northern Andes, is the region with the greatest number of species and morphological diversity (Killip, "The Andean species of *Tournefortia*," Smithsonian Institution Archives, unpublished; Miller, 1988). The species described below is one of many narrowly distributed endemics in mid-elevation Andean forests.

**Tournefortia restrepoae** J. S. Miller, sp. nov. TYPE: Colombia. Nariño: Mpio. de Ricaurte, Reserva Natural La Planada, elev. 1800 m, 18 Nov. 1993 (young fruits), *Carla Restrepo 778* (holotype, MO 4619857; isotype, PSO not seen). Figure 1.

Frutex sciophilus. Folia alterna; lamina elliptica ad elliptico-oblonga vel leviter obovata, 12–24 cm longa, 6–11 cm lata, apice acuminata, base acuta, supra hirsuta, infra strigosa, adaxialiter manifeste aequaliter pustulata, nervis tertiariis depressis, areolis elevatis; petiolo 1.7–5 cm longo, supra canaliculato, dense brunneo-pubescenti. Inflorescentia internodalis, cymosa; pedicellis 1.5–2(–4) mm longis inter se 1–7 mm distantibus. Flos sepalis lanceolatis, 4–6 mm longis, pubescentibus; corolla tubiformi, ca. 6 mm longa, lobulis anguste ovatis, ca. 2 mm longis; staminibus ignotis; stylo 4 mm longo. Fructus late ovoideus, albus, glaber.

Understory shrub. Leaves alternate, blades elliptic to elliptic-oblong or slightly obovate, 12–24 cm long, 6–11 cm wide, the apex acuminate, the base acute, sometimes asymmetrically so, the margin entire, somewhat undulate, the adaxial surface prominently and evenly pustulate with the tertiary venation depressed and the areoles elevated, hirsute with several erect, siliceous hairs arising from each areole, the abaxial surface strigose with the slightly appressed hairs mostly restricted to the veins, each areole with one to several sunken pits, the venation brochidodromous with 9–16 secondary veins; petioles 1.7–5 cm long, canaliculate on the adaxial surface, densely brown pubescent. Inflorescence internodal, a dichotomously branched cyme, the branches 6–10 cm long, the peduncle 7.5 cm long, both densely brown pubescent. Flowers on 1.5–2(–4)-mm-long pedicels, 1–7 mm apart, bisexual; sepals green, lanceolate, ± equal, 4–6 mm long, 0.4–1.3 mm wide, sparsely but obviously pubescent; corolla tubular, ca. 6 mm long, the lobes narrowly ovate, ca. 2 mm long; stamens unknown; ovary ovoid, ca. 1 mm long, ca. 0.5 mm broad, borne on an annular nectariferous disk, the style ca. 4 mm long, the stigma conical. Fruits white, drupaceous, the exocarp glabrous, the mesocarp thin, the endocarp distinctly 4-parted, broadly ovoid, ca. 5 mm long, ca. 4 mm wide.

*Distribution. Tournefortia restrepoae* is known only from the type collection from cloud forest at 1800 m at La Planada in Nariño, Colombia.

*Tournefortia restrepoae* is a distinctive member of *Tournefortia* sect. *Tournefortia*, which is by far the largest section of the genus, containing the majority of the neotropical species, and is characterized by having free anthers and fruits that are unlobed and lack a corky mesocarp. E. P. Killip's unpublished treatment of the Andean species of the genus recognized 38 species in the section, none of which appear very close to *T. restrepoae*. The species is distinct in its alternate, distinctly pustulate leaves and widely spaced, pedicellate flowers. The leaf surface is unique in the genus. The type collection is mostly in young fruit with only the old remains of a few floral parts, thus better knowledge of relationships will require the collection of better flowering material. The species is named in honor of Carla Restrepo, who has done much to improve our knowledge of the plants of the Andean Cordillera in Colombia.

Figure 1. *Tournefortia restrepoae* J. S. Miller (*Restrepo 778*). —A. Fruiting branch. —B. Section of infructescence showing fruiting calyx. —C. Lateral and apical view of fruit. —D. Upper leaf surface. —E. Lower leaf surface.

*Paratypes.* COLOMBIA. **Nariño:** Mpio. de Ricaurte, Reserva Natural La Planada, elev. 1800 m, *Restrepo 730* (PSO not seen).

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Literature Cited

Miller, J. S. 1988. A revised treatment of Boraginaceae for Panama. Ann. Misssouri Bot. Gard. 75: 456–521.

# *Aristida tuitensis* (Poaceae: Aristideae), a New Species from El Tuito, Jalisco, Mexico

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ABSTRACT. A new species, *Aristida tuitensis* from El Tuito, Jalisco, Mexico, is described and illustrated, and its distribution and ecology are discussed. It belongs to *Aristida* sect. *Streptachne* and is distinguished from *A. schiedeana* by its spreading inflorescence, shorter spikelets, and the lack of dentate glumes, and from *A. hintonii* by its inflorescence shape, the internode, and sheath length. A table summarizing the differences and similarities among the three species is presented.

As part of research to revise the genus *Aristida* L. section *Streptachne* (R. Brown) Domin, some unusual specimens of *Aristida* were collected in the area of El Tuito, Jalisco, Mexico, in early 1993. The material was initially identified as *A. schiedeana*, a common grass in the area. However, with additional studies of these specimens, as well as other collections from IBUG and COCA, it was realized that these specimens represent a new species.

**Aristida tuitensis** Sánchez-Ken & P. Dávila, sp. nov. TYPE: Mexico. Jalisco: Municipio El Tuito, El Tuito, 9 a 10 km sobre la brecha a las Minas del Cuale (E de El Tuito), elev. 1900 m, 13 ene. 1991, *J. Sánchez-Ken, M. Mayfield & B. Westlund 500* (holotype, MEXU; isotypes, ENCB, IBUG, MICH, MO). Figure 1.

Gramen perenne caespitosum; internodia ramosa, 9–15 infra inflorescentiam; vaginae coriaceae internodiis longiores; ligulae externae presentes; spiculae effusae binatae; glumae infernae glumis supernis longiores; glumae infernae no dentatae, 3-nervatae, nervis centrales conspicui, nervi laterales inconspicui; calli 0.7–1.0 mm longi; lemmata glumis breviores vel eas aequantes raro; columnae lemmatum 6–10 mm longae; aristae laterales absentes; antherae 3–4 mm longae.

Perennial tufted grass, erect; pseudorhizome present, 80–120 cm long. Internodes 2.0–9.0(–12.0) cm long, 1–2 mm diam., glabrous, straight, terete, bamboo-like, branched, with 9–15 internodes below the inflorescence; nodes glabrous, inconspicuous. Leaf sheaths 3–9 cm long, 4–6 mm wide, longer than the internodes, strongly overlapping, glabrous, not striate, strongly coriaceous, including the margins; inner ligule ciliate, 0.2–0.3 mm long; auricles lacking, sometimes a tuft of lateral hairs 2 mm long instead of the auricles in juvenile stages; outer ligule or contra ligule present; blade 10–50 cm long, 2–4 mm wide, linear, flat, straight to slightly flexuous when dry, adaxially scaberulous with scattered hairs toward the base, abaxially smooth or rarely scaberulous, with 7 main conspicuous nerves, but with 21, 23, or 25 nerves in total. Inflorescence an open panicle, 14–35 cm long, 12–20 cm wide; basal internode 18–70 cm long; peduncule 11–30 cm long, glabrous or scaberulous; branches 9–13(–15) cm long, branching until 5th order, ascendant, strongly spreading, with the spikelets located at the apex; pulvinus present in the axils of all branches and pedicels, glabrous; pedicels 5–18 mm long. Spikelets usually paired, 20–28 mm long from the base of glumes to the tip of the awn, spreading; glumes varying in size, usually the first larger than the second one, sometimes the second glume larger, persistent; first glume 4–8 mm long, to 1 mm wide, 3-nerved, the two lateral nerves inconspicuous, glabrous, keeled and scabrous in the keel, apically acute and awned, not dentate, awn 0.5–2.0 mm long; second glume 6.0–7.5 mm long, to 1.0 mm wide, 1-nerved, keeled and glabrous in the keel, apically obtuse and awned, not dentate, the awn 0.5–1.0 mm long; calluses 0.7–1.0 mm long; lemma shorter than or sometimes as long as the glumes, 4.5–6.0 mm long without the column, 1.0–1.3 mm wide, convolute, 3-nerved, terete, scaberulous in the upper third, not articulate with the column, not articulated; column 6–10 mm long, twisted, abaxially scaberulous, adaxially muricate, basally geniculate; awn 1, 8–10 mm long, straight, basally geniculate, thin; lateral awns lacking; palea 0.5–0.7 mm long, not keeled, smooth; lodicules 2, 1.0–1.2 mm long, hyaline; stamens 3; anthers 3–4 mm long; stigma 1–2 mm long. Caryopsis not seen.

*Distribution. Aristida tuitensis* is endemic to the area of El Tuito in the state of Jalisco, northeast of Chamela. It occurs in a pine and oak forest that also contains some elements that are characteristic

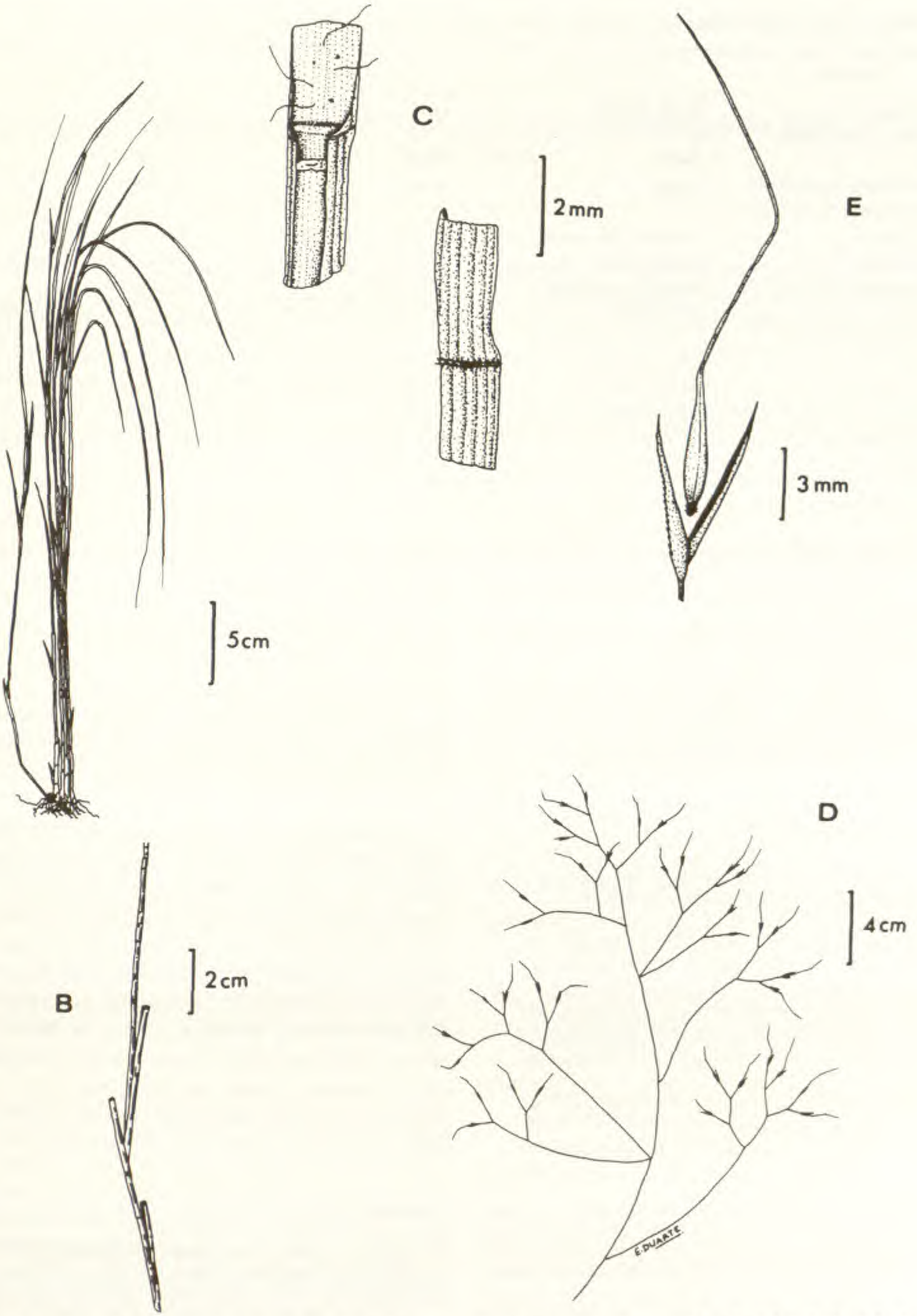


Figure 1. *Aristida tuitensis* Sánchez-Ken & P. Dávila. —A. Habit. —B. Stem. —C. Adaxial and abaxial view of the leaf sheath. —D. Inflorescence. —E. Spikelet (all from *Sánchez-Ken et al. 500*).

of a tropical rainforest. Altitudinally, it ranges from 1300 to 1900 m. The soils are reddish and usually sandy to clayish. Flowering occurs between September and January.

According to Henrard's (1929) criteria, this species belongs to *Aristida* sect. *Streptachne*. As shown by the herbarium annotations, this species was confused with *A. schiedeana* in *Flora Novo-Galiciana*

Table 1. Morphologic comparison among *Aristida tuitensis*, *A. hintonii*, and *A. schiedeana*.

| Character | *A. tuitensis* | *A. hintonii* | *A. schiedeana* |
|---|---|---|---|
| Branching | basal, middle | basal | basal |
| Number of internodes | 9–15 | 2–10 | 2–7 |
| Stem | shorter | longer | longer |
| Sheath length compared with internode length | longer | shorter | shorter |
| Leaf shape | straight to flexuous | straight to flexuous | flexuous to coiled |
| Inflorescence | few-flowered | flowered | few-to many-flowered |
| Inflorescence branches | strongly spreading | spreading | appressed |
| Pulvinus | all branches | usually all branches | usually only first-order branches |
| Spikelet | usually paired | paired and triads | paired and triads |
| Larger glume | usually the first | usually the second | second or first |
| Glumes | not dentate | dentate | dentate |
| Lateral awns | lacking | 0.1–1.0 mm | 0.1–2.0 mm |
| Anthers | 3–4 mm | 1.5–2.0 mm | 1.5–2.0 mm |

(McVaugh, 1983). However, *A. tuitensis* has reliable diagnostic characters by which it can be distinguished from *A. schiedeana* and *A. hintonii*, probably the two most closely related species (Table 1). A notable character of *A. tuitensis* is the relatively long anthers compared to the lemma body. To our knowledge, such long anthers have not been reported in any other species of the genus.

Artificial Key to Three Related Species of *Aristida* Sect. *Streptachne*

1a. Anthers 3–4 mm long; sheaths not striate; inflorescence branches strongly spreading ..... *A. tuitensis*

1b. Anthers 1.5–2 mm long; sheaths striate; inflorescence branches slightly spreading or appressed.

2a. Spikelets usually spreading; pulvinus usually in all branches; leaf blades straight to flexuous; lateral awns up to 1.0 mm long ..... *A. hintonii*

2b. Spikelet appressed to branches; pulvinus in the branches of 1st order; leaf blades flexuous to coiled; lateral awns up to 2.0 mm long ..... *A. schiedeana*

The specific epithet refers to the area in which the species was discovered, El Tuito. Many other taxa have recently been discovered in this region.

*Paratypes*. MEXICO. **Jalisco:** Mpio. Cuautitlán, Cerca de 10 km al sur-suroeste de las Joyas, Sierra de Manantlán, *R. Guzmán 6120* (COCA); Mpio. El Cuale, Lado este de las Minas de Zimapán, brecha a Cuale, *R. Guzmán M. 6101a* (IBUG); Mpio. El Tuito, 30 mi. S of Puerto Vallarta, *A. A. Beetle et al. M-3610* (COCA); Al sur-sureste de Puerto Vallarta, 14 km por la brecha a Minas de Zimapán, 1 km al oeste de Providencia por la brecha El Tuito-El Cuale, *R. Guzmán M. 6094* (COCA); Km 2 por la brecha a Minas de Zimapán, *F. J. Santana M. 1196* (IBUG); Km 14 de la brecha El Tuito-Minas Zimapán, 1 km al oeste del Aserradero Provincia, *F. J. Santana M. 1204* (IBUG); Mpio Talpa, Entre Cuale y Talpa, *J. de la Torre V. s.n.* (IBUG).

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Literature Cited

Henrard, T. 1929. A monograph of the genus *Aristida*. Meded. Rijks-Herb. Leiden no. 58: 1–156.

McVaugh, R. 1983. Gramineae. *In*: Flora Novo-Galiciana: A Descriptive Account of the Vascular Plants of Western Mexico. Vol. 14. The Univ. Michigan Press, Ann Arbor.

# Novelties in the Neotropical Genus *Ouratea* Aublet (Ochnaceae)

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ABSTRACT. A new section of *Ouratea*, section *Caducae* Sastre, and eight new species of *Ouratea* from Venezuela and adjacent countries are described: *O. pendulosepala* Sastre (sect. *Cardiocarpae*), *O. oligantha* Steyermark ex Sastre (sect. *Cardiocarpae*), *O. apurensis* Sastre (sect. *Ouratea*), *O. paratatei* Sastre (sect. *Ouratea*), *O. cidiana* Sastre (sect. *Ouratella*), *O. guriensis* Sastre (sect. *Ouratella*), *O. pseudoguildingii* Sastre (sect. *Ouratella*), and *O. squamata* Sastre (sect. *Ouratella*).

During preparation of the Ochnaceae treatment for the *Flora of the Venezuelan Guayana*, approximately 20 undescribed species of *Ouratea* Aublet from southern Venezuela and adjacent areas have been found. In order to properly place these new species within the subgeneric classification, a brief review and update of the previous system (Sastre, 1988) is needed. In the previous classification, I recognized six sections: *Kaieteurea* (Dwyer) Sastre, *Cardiocarpae* (Engler) Sastre, *Polyouratea* (Tieghem) Sastre, *Persistens* Sastre, *Ouratella* (Tieghem) Sastre, and *Ouratea*, which is the type section of the genus (with *O. guianensis* Aublet as the type). The new system also has six sections, but section *Persistens* is now placed in synonymy of section *Ouratea*, and section *Caducae* is newly described below.

Aublet's (1775) description of *Ouratea guianensis* was based on a flowering sheet (in BM), illustrated by plate no. 152, and all additional material of this species studied for my 1988 classification was either in flower or old fruit, making it impossible to assess the structure of the carpids (fruiting carpels) with precision. Recent study of herbarium specimens of *O. guianensis* from CAY, MO, NY, and VEN clearly shows, however, that its carpids are similar to those of the species previously included in section *Persistens*. This necessitates the transfer of section *Persistens* into the type section, and the recognition of a new section to include species previously (and erroneously) thought to be closely related to *O. guianensis*, but whose fruit structure is now seen to be different.

**Ouratea** sect. **Caducae** Sastre, sect. nov. TYPE: *Ouratea longifolia* (Lamarck) Engler in Mart., Fl. Bras. 12(2): 316. 1876. *Ochna longifolia* Lamarck, Encycl. Méth. 4: 511. 1798.

Inflorescentia terminalis, flores 5 sepalis, 5 carpellis, fructus 5 sepalis caducis, 1–3 carpellis verticalibus.

Inflorescence terminal, flowers with 5 sepals and 5 carpels, sepals caducous in fruit, fruiting carpels 1–3, vertical.

KEY TO THE SECTIONS OF *OURATEA*

1. Flowers with 2–4 sepals united in 2–3 parts .. ..... 1. sect. *Kaieteurea*
1. Flowers with 5 distinct sepals ..... 2
2(1). Fruits with the carpels borne horizontally .. ..... 2. sect. *Cardiocarpae*
2. Fruits with the carpels borne vertically ..... 3
3(2). Flowers with (5)6–10 carpels ..... ..... 3. sect *Polyouratea*
3. Flowers always with 5 carpels ..... 4
4(3). Fruits with persistent sepals ... 4. sect. *Ouratea*
4. Fruits without sepals ..... 5
5(4). Inflorescences axillary, rarely terminal .... ..... 5. sect. *Ouratella*
5. Inflorescences always terminal 6. sect. *Caducae*

DESCRIPTION AND NOMENCLATURE OF THE SECTIONS

1. *Ouratea* Aublet sect. *Kaieteurea* (Dwyer) Sastre, Bull. Mus. Natl. Hist. Nat. 4°. sér. 10, sect. B Adansonia 1: 50. 1988. *Kaieteurea* Dwyer, Bull. Torrey Bot. Club 70: 50. 1943. TYPE: *Ouratea gillyana* (Dwyer) Sandwith & Maguire.

Inflorescence terminal or axillary; flowers with 2–4 sepals united in 2–3 parts, and 5 (–7 in *O. articulata* Sastre) carpels; fruits with sepals caducous or persistent and the carpels vertical.

2. *Ouratea* Aublet sect. *Cardiocarpae* (Engler) Sastre, Bull. Mus. Natl. Hist. Nat. 4°. sér. 10, sect. B Adansonia 1: 55. 1988. *Ouratea* sect. *Eugomphia* (Planchon) Engler, ser. *Cardiocarpae* Engler in Mart., Fl. Bras. 12(2): 307. 1876. TYPE: *Ouratea cardiosperma* (DC.) Engler.

*Diouratea* Tieghem, Ann. Sci. Nat. Bot. sér. 8, 16: 227. 1902.

Inflorescence terminal; flowers with 5 sepals and 5 carpels; fruit with the carpels horizontal.

3. *Ouratea* Aublet sect. *Polyouratea* (Tieghem) Sastre, Bull. Mus. Natl. Hist. Nat. 4°. sér. 10, sect. B Adansonia 1: 55. 1988. *Polyouratea* Tieghem, Ann. Sci. Nat. Bot. sér. 8, 16: 268. 1902. TYPE: *Ouratea hexasperma* (A. St. Hilaire) Baillon.

Inflorescence terminal; flowers with 5 sepals and 6–10 carpels; fruit with the carpels vertical.

4. *Ouratea* Aublet sect. *Ouratea*. TYPE: *Ouratea guianensis* Aublet.

*Ouratea* sect. *Persistens* Sastre, Bull. Mus. Natl. Hist. Nat. 4°. sér. 10, sect. B Adansonia 1: 59. 1988.

Inflorescence terminal; flowers with 5 sepals and 5 carpels; fruits with sepals persistent and the carpels vertical.

5. *Ouratea* Aublet sect. *Ouratella* (Tieghem) Sastre, Bull. Mus. Natl. Hist. Nat. 4°. sér. 10, sect. B Adansonia 1: 59. 1988. *Ouratella* Tieghem, Ann. Sci. Nat. Bot. sér. 8, 16: 289. 1902. TYPE: *Ouratea mexicana* (Humboldt & Bonpland) Engler.

Inflorescence axillary, rarely terminal, spicate or paniculate; flowers with 5 sepals and 5 carpels, fruit with carpels vertical.

6. **Ouratea** Aublet sect. **Caducae** Sastre. TYPE: *Ouratea longifolia* (Lamarck) Engler.

*Ouratea* Aublet sect. *Ouratea*, pro parte fide Sastre (1988) excluding *O. guianensis*.

See description above.

Inflorescence terminal; flowers with 5 sepals and 5 carpels; fruit with carpels vertical.

Following are descriptions of eight new species in sections *Cardiocarpae* (two species), *Ouratea* (two species), and *Ouratella* (four species). The description of new species in section *Caducae* will be presented in a future paper.

*Ouratea* Section *Cardiocarpae*

**Ouratea pendulosepala** Sastre, sp. nov. TYPE: Brazil. Amazonas: Mun. Pres. Figueredo, 8 km da Vila Residêncial Atrari, Canteiro de obras de Balbina. 1°30′–2°S, 59°30′–60°W, mata de terra firme, solo argiloso, 19 sep. 1986 (fr), *C. A. Cid Ferreira et al. 8219* (holotype, P; isotypes, INPA not seen, NY not seen). Figure 1.

Ab *Ouratea cerebroidea* Sastre, foliis nervis non impressis, paucis visibilibus, margine sub-integra, sepalis 12 × 2 mm, persistentibus pendusque in fructu, staminibus papillatis, stylo 10 mm longo, differt.

Tree 12 m tall, branches glabrous. Leaves coriaceous, 12–16 cm long, 5–6 cm wide, obovate, apex acuminate, base attenuate, margin undulate, subentire, principal vein salient on lower surface, lateral veins faintly evident. Inflorescence paniculate, terminal, 14 cm long. Peduncle 13–15 mm long, weakly papillate; sepals 5, 10–11 × 2 mm, ovate; petals 5, obovate, 15–16 × 6–7 mm; stamens 10, papillate, 10 mm long. Young fruits with peduncle 15 mm long, sepals 5, pendent and persistent in older fruits, 12 × 2 mm, ovate. Fruits with 1–4 horizontal carpels, the carpophore subcylindric.

Until now, section *Cardiocarpae* was restricted to the Guianas and had only two species: *Ouratea cardiosperma* (DC.) Engler and *O. cerebroidea* Sastre. The pendent, persistent sepals are characteristic of the new species and are unknown in the other species of *Ouratea*.

*Paratypes.* BRAZIL. **Amapá:** Camipi, EMBRAPA reserve and vicinity, 00°10′N, 51°37′W, 6 Sep. 1983, *S. Mori et al. 15864, 15865, 15868, 15869, 15874* (MG not seen, NY not seen, P). **Amazonas:** Mun. Barcelos, 00°30′N, 63°30′W, rio Aracá, 3 jul. 1985, *E. Sette Silva et al. 214* (INPA not seen, NY not seen, P). **Pará:** Mun. de Almeirin, Mte. Dourado, estrada MTD-oeste em direção a serra da mina de bauxita, 17 sep. 1985 (fl), *M. J. P. Pires et al. 627* (K not seen, P).

**Ouratea oligantha** Steyermark ex Sastre, sp. nov. TYPE: Venezuela. Bolívar: Alto Río Cuyuní, SE escarpment of Cerro Pitín, Cordillera Epicara, 400 m, *B. Maguire, J. A. Steyermark & C. Maguire 53644* (holotype, NY). Figure 2.

Ab *Ouratea pendulosepala* Sastre, inflorescentiis parvis (4–10 cm longis), laminis parvis (7–9 cm longis) et sepalis caducis in fructus, differt.

Shrub 1.5–4 m tall, branches glabrous. Petiole 1 cm long, leaves coriaceous, 7–9 × 3–3.5 cm,

Figures 1–4. —1. *Ouratea pendulosepala* Sastre; *Cid Ferreira et al. 8219* (holotype, P). —2. *Ouratea oligantha* Steyermark ex Sastre; *Maguire et al. 53644* (holotype, NY). —3. *Ouratea apurensis* Sastre; *Steyermark et al. 101762* (holotype, P). —4. *Ouratea paratatei* Sastre; *Blanco 525* (holotype, P).

elliptic, apex acuminate, base obtuse, margins toothed, undulate, principal vein salient on lower surface, with 8–12 unpaired lateral veins on each side of the principal vein, ascending, salient on lower surface between the small, subparallel veins, a few of which are also salient. Inflorescences usually axillary, sometimes terminal, spicate or sometimes paniculate, 4–10 cm long. Pedicel 12 mm long, sepals 5, 7 × 2 mm, oblong; petals 5, 15 × 6 mm, ovate; stamens 10, 1 cm long, carpels 5, horizontal; style single, 5.5 mm long. Young fruit with peduncle 15 mm long, sepals late-caducous, carpels 1–3, hemispheric, carpophore conical.

*Distribution.* Known only from the type locality.

The type and paratypes cited here were annotated by Steyermark at different times as "*O. oligantha* sp. nov." and "*O. soderstromii* Sastre." I have chosen to use Steyermark's name for the new species. The material cited clearly does not belong to *Ouratea soderstromii;* the new species belongs to section *Cardiocarpae*, while *O. soderstromii* is a member of section *Ouratella*. The name used by Steyermark is validated here. *Ouratea oligantha* is most closely related to *O. pendulosepala*, described above, but differs by the short inflorescences (4–10 cm), that are usually spicate (vs. largely paniculate), short leaves (7–9 cm long), and the sepals caducous in fruit. *Ouratea pendulosepala* has longer inflorescences (14 cm long), longer leaves (12–16 cm long), and persistent sepals. *Ouratea oligantha* is the first species of section *Cardiocarpae* known in Venezuela.

*Paratypes.* VENEZUELA. **Bolívar:** Alto Río Cuyuní, Río Chicanan, Cerro Pitín, Cordillera Epicara, 3 sep. 1962, *Maguire et al. 53568* (NY), 9–11 sep. 1962, *Maguire et al. 53679* (NY).

*Ouratea* Section *Ouratea*

**Ouratea apurensis** Sastre, sp. nov. TYPE: Venezuela. Apure: Reserva Forestal San Camilo, selva siempreverde a lo largo de la Quebrada de la Cristalina hasta la vega del Cerro la Nulita, 250–280 m, 2 apr. 1968, *Steyermark et al. 101762* (holotype, P; isotypes, NY, VEN). Figure 3.

Ab *Ouratea marahuacensi* Maguire et Steyermark, folia petiolo 2–3 mm longo (non 5–9 mm) nervis lateralibus prominentibus, sepalis 8 × 2–3 mm, petalis 10 × 5 mm, staminibus 7.5 mm longis, stylo 7.5 mm longo, differt.

Tree 7 m tall, branches glabrous. Petioles 2–3 mm long, leaf blades elliptic, undulate, 6.5–9 × 2–2.5 cm, apex acuminate, base attenuate, margin crenulate, principal vein salient on the lower surface, lateral vein prominent, transversal tertiary veins parallel. Inflorescence paniculate, terminal, 8–11 cm long. Peduncle 5–6 mm long, with short hairs 0.2–0.3 mm long; sepals 5, oblong-lanceolate, 8 × 2–3 mm; petals 5, obovate, 10 × 5 mm; stamens 10, 7.5 mm long; style 7.5 mm long. Young fruits with sepals persistent.

Both *Ouratea marahuacensis* Maguire & Steyermark and *O. apurensis* occur in Venezuela, the former on Cerro Marahuaca, Estado Amazonas, at 1150 m elevation, the latter in the Reserva Forestal San Camilo, Estado Apure. *Ouratea apurensis* differs from *O. marahuacensis* by the shorter petiole (2–3 mm long vs. 5–9 mm long), salient lateral veins, longer sepals (8 mm long vs. 6–7.5 mm long), longer petals (10 mm long vs. 6–7.5 mm long), and longer stamens (7.5 mm long vs. 5–6 mm long).

*Ouratea apurensis* is known only from the type collection.

**Ouratea paratatei** Sastre, sp. nov. TYPE: Venezuela. Bolívar: Campamentos "El Paraiso" y "La Yagua" a 48 km NE del caserio Las Rosas, este ultimo a 17 km de Upata (carretera nueva Upata-San Felix), jun. 1966, *Blanco 525* (holotype, P; isotypes, NY, VEN). Figure 4.

Ab *Ouratea tatei* Gleason, lamina elliptica viridi, nervo principali prominenti pagina superiore, nervis lateralibus non impressis, differt. Ab *O. pseudotatei* Maguire et Steyermark, lamina nervo principali prominenti pagina superiore, nervis tertiaris paucis visibilibus (non impressis), fructus sepalis persistentibus, differt.

Tree 7 m tall, branches glabrous. Petiole 1 cm long, leaf blade coriaceous, elliptic-ovate, 14–19 × 4.5–7 cm, apex acuminate, base obtuse to round, margin undulate-denticulate, principal vein raised on upper surface, lateral veins subequal, tertiary veins anastomosing, faintly evident. Inflorescence paniculate, terminal, 12 cm long. Flowers not known. Fruits with 5 persistent sepals, these 7 × 2.5 mm, lanceolate, acuminate, the carpels 1–3, obovate, 8–9 × 5.6–6 mm, carpophore conical, 5–6 mm long, peduncle 1 cm long.

*Ouratea tatei* Gleason, *O. pseudotatei* Maguire & Steyermark, and *O. paratatei* are similar, but the fruits of *O. pseudotatei* do not have persistent sepals and so belong to section *Caducae*; *O. pseudotatei* is endemic to Guyana. *Ouratea tatei* and *O. paratatei* are Venezuelan species, the former occurring in the highlands of Estado Bolívar (Roraima-tepui, Chimantá-tepui), the latter from the

lowlands of Estado Bolívar in the Sierra de Imataca. The differences of the Venezuelan species in section *Ouratea* are outlined in the key below.

KEY TO THE VENEZUELAN SPECIES OF *OURATEA* SECT. *OURATEA*

1. Leaf blades with 2 types of secondary veins: large ascending ones terminating along the blade margin, and between these and the midvein, some smaller, horizontal, ± parallel veins ..... 2
1. Leaf blades with subequal secondary veins .... 4
2(1). Leaves 18–22 cm long, sepals 9–10 mm long ..... *O. guianensis* Aublet
2. Leaves 5–9 cm long, sepals 5–8 mm long ... 3
3(2). Petiole 2–3 mm long; sepals 8 mm long; petals 10 mm long ..... *O. apurensis* Sastre
3. Petiole 5–9 mm long; sepals 6–7.5 mm long; petals 5–6 mm long ..... .... *O. marahuacensis* Maguire & Steyermark
4(1). Leaves 12–19 cm long ..... 5
4. Leaves 3–12 cm long ..... 6
5(4). Leaf blades oblong, veins on the lower surface of the blade impressed ..... *O. tatei* Gleason
5. Leaf blades elliptic-ovate; veins on the lower surface of the blade not impressed ..... ..... *O. paratatei* Sastre
6(4). Leaf margin clearly undulate and toothed .. ..... *O. superba* Engler
6. Leaf margin few-toothed ..... 7
7(6). Leaf blades 3–6 × 1.7–2.7 cm ..... .....*O. longistyla* Maguire & Steyermark
7. Leaf blades 6–12 × 3–5 cm ..... ..... *O. spruceana* Engler

*OURATEA* SECT. *OURATELLA*

**Ouratea cidiana** Sastre, sp. nov. TYPE: Brazil. Pará: Mun. Oriximina, Rio Trombetas a montante do Cachoeira Portura prox. as ilhas Resposta, 00°52′S, 57°03′W, 22 aug. 1986, *Cid Ferreira et al. 7971* (holotype, P; isotypes, INPA not seen, NY not seen). Figure 5.

Ab *O. soderstromii* Sastre basi foliae obtusa vel rotundata, margine serrata, inflorescentia 2–8 cm longa differt.

Shrub 3 m tall, stems glabrous. Leaves coriaceous, elliptic, 6–9.5 × 1.5–4 cm; base rounded; margin undulate and denticulate; apex acuminate; principal vein slightly prominent above, with 9–11 unpaired, arcuate lateral veins on each side of principal vein, with fine and parallel intersecondaries; petiole 5–6 mm long. Inflorescences axillary, spicate, 2–8 cm long, the peduncle 4 mm long. Sepals 5, obovate, 6 × 3 mm; petals 5, obovate, 7 × 4 mm; stamens 10, anthers sessile, 5 mm long; style 6 mm long. Fruit not seen.

*Distribution.* Known only from the type locality, in Rio Trombetas, Pará, Brazil.

*Ouratea cidiana* differs from *O. soderstromii* by its rounded leaf bases (vs. obtuse); serrate margins (vs. denticulate), and inflorescences 2–8 cm long (vs. 8–10 cm).

*Paratype.* BRAZIL. **Pará:** Rio Trombetas, near Cachoeira Porteira, 28 May 1974, *Campbell et al. P.22383* (COL, INPA not seen, NY).

**Ouratea guriensis** Sastre, sp. nov. TYPE: Venezuela. Bolívar: Represa Guri, islands and W side of river, 1 Apr. 1981, *Liesner & González 11081* (holotype, VEN; isotypes, MO, NY). Figure 6.

Ab *O. soderstromii* Sastre nervis II et III anastomosantibus, inflorescentiis 2–8 cm longis, carpophoro fructi discoideo 3 mm alto (non conico 10–13 mm alto) differt.

Shrub 1.5 m tall, stems glabrous. Leaves coriaceous, unequal, elliptic, 6–9.5 × 1.5–4 cm; base obtuse or rounded, margin undulate and serrate, apex acuminate; principal vein slightly prominent on lower surface, the secondary veins subequal and anastomosing with the tertiary; petiole 5–7 mm long. Inflorescences axillary, spicate, 2–8 cm long with 1–3 leaves in the basal part, the peduncle 6 mm long. Sepals 5, coriaceous, triangular, 7 × 3 mm; petals 5, obovate, 9–10 × 1.5–2 mm; stamens 10, 6 mm long. Fruits with carpophore discoid, 3 × 8 mm, carpels 7–9 × 4–5 mm.

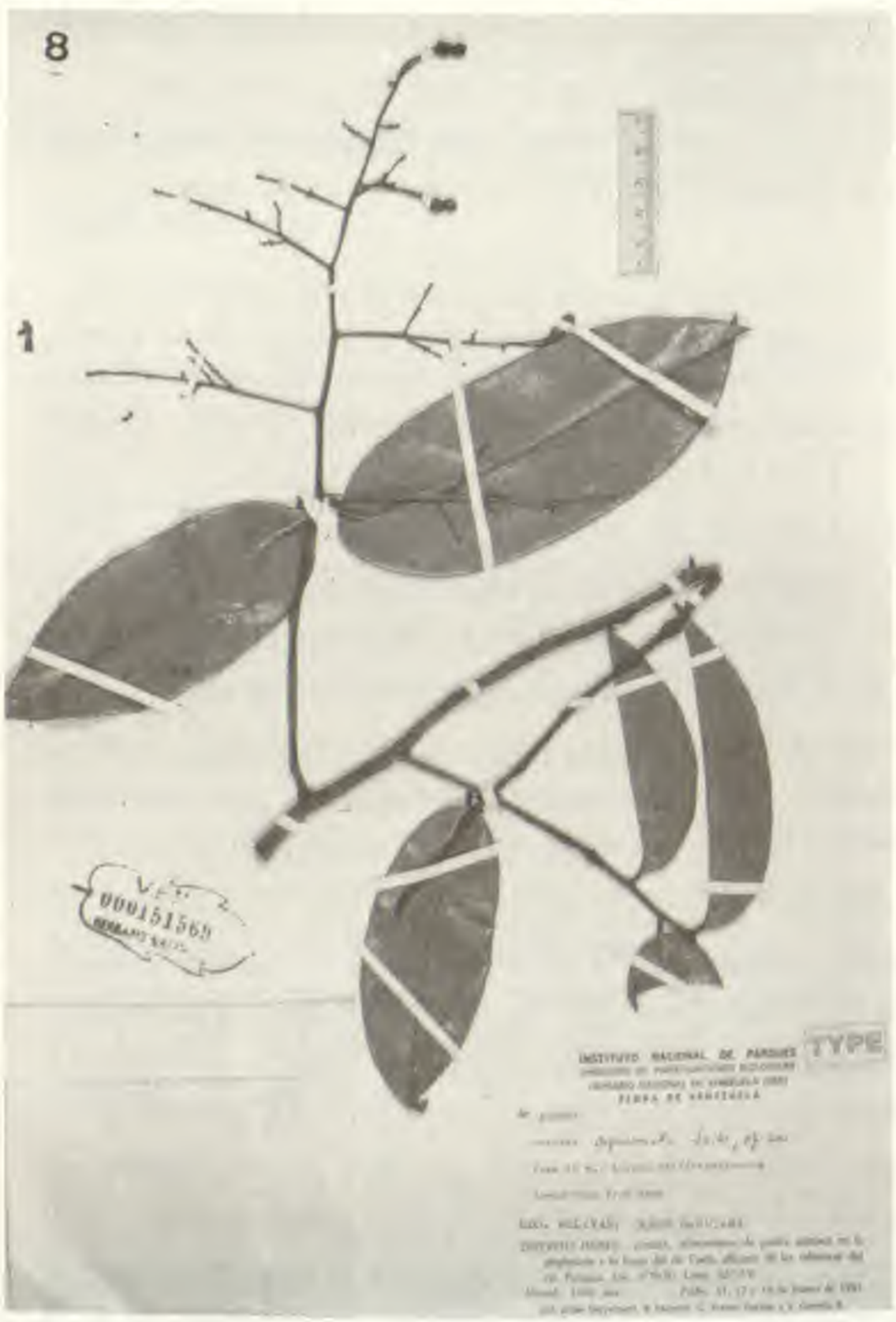
*Distribution.* Known only from the type locality in Estado Bolívar near the Guri Dam.

*Ouratea guriensis* differs from *O. soderstromii* by its anastomosed secondary and tertiary veins, inflorescence 2–8 cm long (vs. 8–10 cm), and carpophore 3 mm long and discoid (vs. 10–13 mm long and conic). It differs from *O. cidiana* by its anastomosed secondary and tertiary veins.

*Paratype.* VENEZUELA. **Bolívar:** Represa Guri, ca. 0.5 km SSW of dam, on a steep forested slope with open rocks at top, ca. 250–350 m, 7°46′N, 63°00′W, 31 Mar. 1981, *Liesner & González 11034* (MO, NY, VEN).

**Ouratea pseudoguildingii** Sastre, sp. nov. TYPE: Venezuela. Bolívar: Río Horeda, 1–4 km above mouth, 90 m, 15 Dec. 1955, *Wurdack & Monachino 39901* (holotype, P; isotype, NY). Figure 7.

Ab *O. guildingii* (Planchon) van Tieghem, foliis apice obtusa (non acuta), nervis II subparallelis (et non inaequalibus cum 8–12 magnis inter nervis subparallelis tenues transversales), differt. Ab *O. grosourdyi* Van Tieghem, foliis apice obtusa (non acuta et mucronata), nervis II et III anastomosantibus, inflorescentiis paniculatis (et non spiciformibus), differt.




Figures 5–8. —5. *Ouratea cidiana* Sastre; *Cid Ferreira et al. 7971* (holotype, P). —6. *Ouratea guriensis* Sastre; *Liesner & González 11081* (holotype, VEN). —7. *Ouratea pseudoguildingii* Sastre; *Wurdack & Monachino 39901* (holotype, P). —8. *Ouratea squamata* Sastre; *Steyermark et al. 123963* (holotype, VEN).

Tree 3–5 m tall, stems glabrous. Leaves coriaceous, elliptic, 3–5.5 × 1.5–2.5 cm; base rounded; margin denticulate; apex obtuse; principal vein prominent below, the secondary veins subparallel, the secondary and tertiary veins anastomosed; petiole 2 mm long. Inflorescence axillary, paniculate, 5–10 cm long, the peduncle 7–8 mm long. Sepals 5, coriaceous, obovate, 8 × 2 mm; petals 5, spathulate, 9 × 6 mm; stamens 10, a few ornate, anthers subsessile, 5 mm long; carpels 5, style 5 mm long. Fruit not seen.

*Ouratea pseudoguildingii* differs from *O. guildingii* by its obtuse leaf apices (vs. acute) and subparallel venation. It differs from *O. grosourdyi* by its obtuse leaf apices (vs. acute and mucronate), secondary and tertiary venation anastomosed (vs. not anastomosed), and paniculate inflorescence (vs. spicate).

*Distribution.* Middle Río Orinoco, Venezuela.

*Paratypes.* VENEZUELA. **Bolívar:** Puerto Ordaz, San Felix, Apr. 1964, *Aristiguieta 5280* (NY, VEN). **Guárico:** Dto. Infante, Municipio Cabrita, laguna del Caïman, Finca los Becerros, 21 mar. 1990, *S. Tillett et al.* SPB 279 (P, UCU).

**Ouratea squamata** Sastre, sp. nov. TYPE: Venezuela. Bolívar: Distr. Heres, cerro Marutani, cumbre, afloramiento de piedra arenisca en la altiplanicie a lo largo del Río Carla, afluente de las cabeceras del Río Paragua, 3°50′N, 62°15′W, 1200 m, 11–14 jan. 1981, *Steyermark et al. 123963* (holotype, VEN; isotype, NY). Figure 8.

Ab *O. poeppigii* van Tieghem foliis inaequalibus, nervis lateralibus pagina superiore impressis, pagina inferiore non visibilibus, nervis II et III anastomosantibus, differt.

Tree, 10 m tall, young stems with scales. Leaves coriaceous, unequal, elliptic, sometimes folded, 10–14 × 4–6 cm; base rounded; margin denticulate; apex acuminate; principal vein prominent below, secondary veins subparallel, impressed above, not apparent below, secondary and tertiary veins anastomosed, petiole 3–4 mm long. Inflorescence axillary, paniculate,16–26 cm long with 1–3 leaves at the basal part, axes with scales. Flowers not seen. Fruit with conical carpophore, 5–6 × 5 mm, carpels 5–6 × 4 mm.

*Distribution.* Known only from the type locality on Cerro Marutaní, Bolívar, Venezuela, near the headwaters of the Río Paragua.

Known only from the type specimen; *Ouratea squamata* differs from *O. poeppigii*, an Amazonian Brazil species, by its unequal leaves, lateral veins impressed above and not apparent below, and the secondary and tertiary venation anastomosed.

KEY TO THE SPECIES OF *OURATEA* SECT. *OURATELLA* FROM VENEZUELA AND ADJACENT AREAS

1. Inflorescence spicate, not or few-branched .... 2
1. Inflorescence paniculate ..... 10
2(1). Inflorescence 11–30 cm long ..... 3
2. Inflorescence 2–10 cm long ..... 4
3(2). Leaves 10–15 × 4–6.5 cm ..... *O. croizatii* Steyermark & Maguire
3. Leaves 6–10 × 3–6 cm ..... *O. grosourdyi* (Tieghem) Steyermark
4(2). Leaf blade with the margin rolled and few-toothed ..... *O. yapacana* Sastre
4. Leaf blade flat with the margin toothed ..... 5
5(4). Leaves 20–60 cm long ..... 6
5. Leaves less than 15 cm long ..... 7
6(5). Leaf blade oblong, 30–60 cm long ..... *O. ramiflora* Sastre
6. Leaf blade ovate, 20–35 cm long ..... *O. ornata* Maguire & Steyermark
7(5). Leaf blade 3–5 × 2–5 cm ..... *O. guaiquinimensis* Sastre
7. Leaf blade 6–15 × 1.5–7 cm ..... 8
8(7). Leaf blade membranous, inflorescences 8–10 cm long ..... *O. soderstromii* Sastre
8. Leaf blade coriaceous, inflorescences 2–8 cm long ..... 9
9(8). Secondary and tertiary leaf venation reticulate ..... *O. guriensis* Sastre
9. Secondary and tertiary leaf venation not reticulate ..... *O. cidiana* Sastre
10(1). Leaf blades with length/width ratio 1–2.5 11
10. Leaf blades with length/width ratio > 2.5 14
11(10). Leaf blades 3–5.5 × 1.5–2.5 cm ..... *O. pseudoguildingii* Sastre
11. Leaf blades 6–15 × 3.5–6 cm ..... 12
12(11). Leaf blade with 2 types of lateral veins; inflorescence 4–7 cm long ..... *O. caracasana* (Planchon) Engler
12. Leaf blade with lateral veins subequal, inflorescence 7–17 cm long ..... 13
13(12). Venation of the leaf blade not impressed, inflorescence 7–10 cm long ..... *O. ramossisima* Maguire & Steyermark
13. Venation of the leaf blade impressed, inflorescence 16–17 cm long ..... *O. timehriensis* Sastre
14(10). Inflorescences 3–5 cm long ..... *O. guildingii* (Planchon) Urban
14. Inflorescences > 5 cm long ..... 15
15(14). Leaf blade with lateral veins subequal, secondary and tertiary veins anastomosed .. 16
15. Leaf blade with 2 types of lateral veins, secondary and tertiary veins not anastomosed ..... 17
16(15). Leaf blades 5.5–8 × 2–3 cm; young stems without scales; inflorescence axis papillate ..... *O. papillata* Maguire & Steyermark
16. Leaf blades 10–14 × 4–6 cm; young stems with scales; inflorescence axis not papillate ..... *O. squamata* Sastre

17(15). Leaf blades coriaceous .....
..... *O. duidae* Steyermark

17. Leaf blades membranaceous .....
..... *O. poeppigii* Van Tieghem

*Ouratea cidiana*, *O. ramiflora*, and *O. poeppigii* occur in Amazonian Brazil, and *O. timehriensis* occurs in Guyana.

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Literature Cited

Aublet, F. 1775. Histoire des plantes de la Guyane française 1: 1–261. Paris.

Engler, A. 1876. Ochnaceae. *In:* Martius, Flora Brasiliensis 12(2): 301–332, pl. 62–77. Monachii.

Kanis, A. 1968. A revision of the Ochnaceae of the Indo-Pacific area. Blumea 16: 1–82.

Sastre, C. 1988. Synopsis generis *Ouratea* Aublet (Ochnaceae). Bull. Mus. Natl. Hist. Nat. Paris 4°. sér., sect. B Adansonia 1: 47–67.

Tieghem, P. van. 1902. Sur les Ochnacées. Ann. Sci. Nat. Bot., sér 8, 16: 161–416.

# New Species and Combinations in Rubiaceae from Costa Rica and Panama

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ABSTRACT. The new combinations *Psychotria nebulosa* (Dwyer) C. M. Taylor and *P. roseocrema* (Dwyer) C. M. Taylor are made, and the following new species are described: *Chiococca caputensis* D. H. Lorence & C. M. Taylor, *Manettia longipedicellata* C. M. Taylor, *Pentagonia lobata* C. M. Taylor, *Psychotria burgeri* C. M. Taylor, *Psychotria saltatrix* C. M. Taylor, and *Rudgea laevis* C. M. Taylor.

During review of Rubiaceae materials for preparation of the *Manual to the Plants of Costa Rica*, the following new species and taxonomic problems were discovered. These comments supplement the treatment by Burger & Taylor (1993).

**Chiococca caputensis** D. H. Lorence & C. M. Taylor, sp. nov. TYPE: Panama. Panamá: Cerro Jefe, NE of Panama City, 9°15′N, 79°30′W, 12 July 1986, *G. McPherson 9744* (holotype, MO 3624428; isotype, PMA not seen). Figure 1B, C.

*Chiococcae belizensi* Lundell similis, sed ab ea corollis albis etiam nervis secundariis brochidodromis semel arcuatis differt.

Glabrous low shrubs or usually woody vines. *Leaves* 2–8 cm long, 1.2–4 cm wide, elliptic, at apex acute to slightly acuminate or sometimes obtuse, at base cuneate, coriaceous; secondary veins 3–5 pairs, brochidodromous, looping once to interconnect, above and below plane, with the costa plane or prominulous on both surfaces; petioles 4–10 mm long; stipules interpetiolar, triangular, 2–3 mm long, acuminate to usually apiculate. *Inflorescences* axillary, 1 per axil, racemose to sometimes 1–2 times branched, 3–6 cm long; peduncles 5–15 mm long; bracts subtending pedicels deltoid to narrowly triangular, 0.5–1.5 mm long; pedicels 1–4 mm long; *calyx* glabrous, green, with hypanthium ellipsoid, somewhat flattened laterally, 2–2.5 mm long, limb 1–1.3 mm long, divided for ca. ½ its length, lobes deltoid, entire to ciliolate; *corolla* glabrous throughout, white becoming cream to pale yellow, funnelform, tube 6.5–7 mm long, ca. 1 mm diam. at base and 4–5 mm diam. at apex, lobes narrowly triangular, 3–4 mm long, acute; *stamens* included, filaments ca. 1 mm long, pilose, anthers very narrowly oblong, 3.5–4 mm long; *style* 11–11.5 mm long, twisted, white, papillose throughout, at apex clavate. *Fruit* ellipsoid, strongly laterally compressed, 8–12 mm diam., white, fleshy.

*Habitat and phenology.* Known only from wet forest on the upper slopes and summit of Cerro Jefe in central Panama, at 550–1000 m. Collected in flower in July, in mature fruit September through February.

*Chiococca caputensis* is similar in its included stamens and climbing habit to *C. alba* (L.) A. S. Hitchcock, which can be distinguished by its papyraceous leaf blades and usually smaller mature fruits, 4–8 mm in diameter. This new species has also been confused with *C. belizensis* Lundell, which has coriaceous leaves, included stamens, and fruit size similar to that of *C. caputensis*, but which can be distinguished from *C. caputensis* by its lemon yellow corollas and secondary leaf veins connected by one to three additional smaller loops outside the principal loops. Additionally, *C. belizensis* is found from sea level to 1500 m but has been collected predominantly below 400 m elevation.

*Chiococca caputensis* has been confused with *C. durifolia* Dwyer, a synonym of *C. belizensis*, and also with *C. jefensis* Dwyer, which is a synonym of *Elaeagia nitidifolia* Dwyer. The specific epithet refers to the type locality, Cerro Jefe, which translated from the Spanish means "chief" mountain. Several other species of Rubiaceae, for example, *Palicourea tubuliflora* Dwyer and *Psychotria olgae* Dwyer & M. V. Hayden, appear to be endemic to this mountain, and *C. caputensis* may be a similar local endemic.

*Paratypes.* PANAMA. **Panamá:** beyond Goofy Lake on road to Cerro Jefe, *Correa & Dressler 467* (MO), *Croat 15235* (MO); Cerro Jefe, NE of Panama City, *Correa et al. 4576* (MO, PMA), *Croat 35865*, *D'Arcy 12192* (MO), *Elias & Hayden 1799* (MO), *Folsom & Harp 1373* (MO), *Folsom 3854* (MO), *Gentry 2878* (MO), *Gentry & Dwyer 5540* (MO), *Gentry 6133* (MO), *Kirkbride & Crobbs 9* (MO), *McDonagh et al. 47* (BM, MO), *McPherson 9733* (MO, PMA), *10012* (MO, PMA), *10032* (MO, PMA, PTBG), *15855* (MO, PMA), *Mori*

*6527* (MO), *7994* (MO), *Sytsma 1490* (MO), *Tyson et al. 3207* (MO), *Tyson 3374* (MO), *Witherspoon 8554* (MO).

**Manettia longipedicellata** C. M. Taylor, sp. nov. TYPE: Costa Rica. Limón: Cantón de Matina, Cordillera Talamanca, 200 m aguas abajo de la confluencia de la quebrada Cañabral con el río Barbilla, 10°00′10″N, 83°25′30″W, 5 Nov. 1988, *G. Herrera 2290* (holotype, CR; isotype, MO 3649361). Figure 1A.

Flores in cymas paucifloras pedunculis 1–2.5 cm longis insidentes aggregati, pedicellis 1–2.5 cm longis; lobis calycinis 4, 2 mm longis; corolla viridula ad rosea, tubo 6–10 mm longo, lobis 4, 3–4 mm longis.

Glabrescent to retrorsely hispidulous, extensively twining, herbaceous to suffrutescent vines. *Leaves* elliptic to ovate or broadly lanceolate, 3–12 cm long, 1.5–5 cm wide, acuminate at apex, cuneate to truncate at base, membranaceous; secondary veins 4–6 pairs; petioles 5–15 mm long; stipules interpetiolar, triangular, 1 mm long, with 4–8 cartilaginous teeth or triangular appendages, these often caducous and the stipules appearing truncate. *Inflorescences* axillary and terminal, cymose, with 1–4 flowers; peduncles 1–2.5 cm long; bracts triangular, to 2.5 mm long, scarious; pedicels 1–2.5 cm long, often thickened near apex and flowers and fruits appearing stipitate; calyx glabrescent, limb 2–4 mm long, divided to base, lobes 4, narrowly triangular, acute, reflexed; corolla tubular, externally glabrous, internally pilose, green to white or usually pink with exserted yellow trichomes in throat, tube 6–10 mm long, lobes ovate, 3–4 mm long, acute. *Capsules* obconic, 5–9 mm long, frequently somewhat dicoccous, compressed laterally; seeds orbicular to somewhat irregular, ca. 2 mm diam.

*Habitat and phenology.* Wet Caribbean slopes of Nicaragua and Costa Rica at 100–1100 m, most frequently collected as a vine climbing on thickets along streams below 300 m elevation. Collected in flower and fruit usually concurrently, February to May and in December.

This new species is similar to *Manettia reclinata* L., which can be distinguished in southern Central America by its six to eight calyx lobes 4–7 mm long, dark red corollas, and pedicels usually 1 cm long or shorter, in contrast to four calyx lobes 2–4 mm long, green to white or pink corollas, and pedicels 1–2.5 cm long in *M. longipedicellata*. Plants of *M. reclinata* from Mexico and northern Central America may have peduncles and pedicels to 4 cm long, but differ in the other characters.

*Paratypes.* COSTA RICA. **Alajuela:** Piedades de San Ramón, *Brenes 4555* (CR). **Cartago:** Florencia Norte, CATIE, Turrialba, *Poveda 3109* (CR). **Heredia:** Finca La Selva, the OTS field station near Puerto Viejo de Sarapiquí, near the junction of the Ríos Puerto Viejo and Sarapiquí, *Almeda & Anderson 5130* (F), *Folsom 8851* (DUKE), *10032* (DUKE), *Grayum 1144* (DUKE), *2711* (DUKE), *Hammel 8099* (DUKE), *11752* (DUKE), *Opler 1645* (CR), *Wilbur 28181* (DUKE), *28308* (DUKE), *38626* (DUKE), *39485* (DUKE). **Limón:** Cantón de Pococí, along road between Mata de Limón (on quadrangle map as "Milloncito") and Millón, 10°24′30″N, 83°37′W, *Grayum & Hammel 8407* (CR, MO). NICARAGUA. **Zelaya:** Caño Monte Cristo, "Las Faldas," 11°36′N, 83°51′W, *Moreno 14776* (MO); Montecristo, al N de Barra Punta Gorda, 11°34′N, 83°48′W, *Sandino 2232* (MO); Caño Costa Riquita, ca. 1.8 km SW of Colonia Naciones Unidas, above road between there and Colonia Nueva León, 11°43′N, 83°18′W, *Stevens 4942* (MO).

**Pentagonia lobata** C. M. Taylor, sp. nov. TYPE: Costa Rica. Puntarenas: Cantón de Golfito, Reserva Natural de Vida Silvestre Golfito, final del camino hacia las torres, 8°39′52″N, 83°10′00″W, 7 Dec. 1992, *B. Hammel 18619* (holotype, MO 4355639; isotypes, CR, F, MO 4355638). Figure 1D.

A speciebus ceteris *Pentagoniae* Bentham foliis pinnatifidis etiam calyce spathaceo differt.

Monocaulous shrub or small tree to 7 m tall; stems lenticellate. *Leaves* 62–99 cm long, 60–90 cm wide, deeply pinnatifid, with sinuses extending to within 3–5 cm of costa, with lobes 4–6 on each side, these acute to somewhat acuminate, 7–14 cm wide, the basalmost lobes usually ca. ½ as long and wide, the entire blade chartaceous to subcoriaceous, glabrous and smooth adaxially, abaxially glabrescent to usually spreading-puberulous or shortly pilosulous on principal veins and sometimes also on lamina, abaxially lamina also finely striate, costa and longer secondary veins prominent above and below, shorter secondary veins slightly thickened, minor venation not visible; *petioles* 12–22 cm long; *stipules* ligulate, 6–8 cm long, 2.5–3.5 cm wide, coriaceous, acute, with costa thickened near base, finely appressed-puberulous to sericeous. *Flowers* hermaphroditic, glomerulate in groups of ca. 12–20 in leaf axils, each inflorescence enclosed by 1 bract resembling a stipule, these bracts 8–9 cm long, 3–7 cm wide, each flower with a stipe 1–3 mm long and subtended by 1 floral bract, these floral bracts 15–25 mm long, 6–12 mm wide, ovate, acute; hypanthium glabrous, cylindrical to ellipsoid, 3–5 mm long, 2–3 mm diam.; *calyx* limb red, coriaceous, glabrous, 2.5–4 cm long, spathaceous, splitting for ca. ⅔ of its length, acute at apex; *corolla* green to cream, funnelform, carnose, fibrous, glabrous

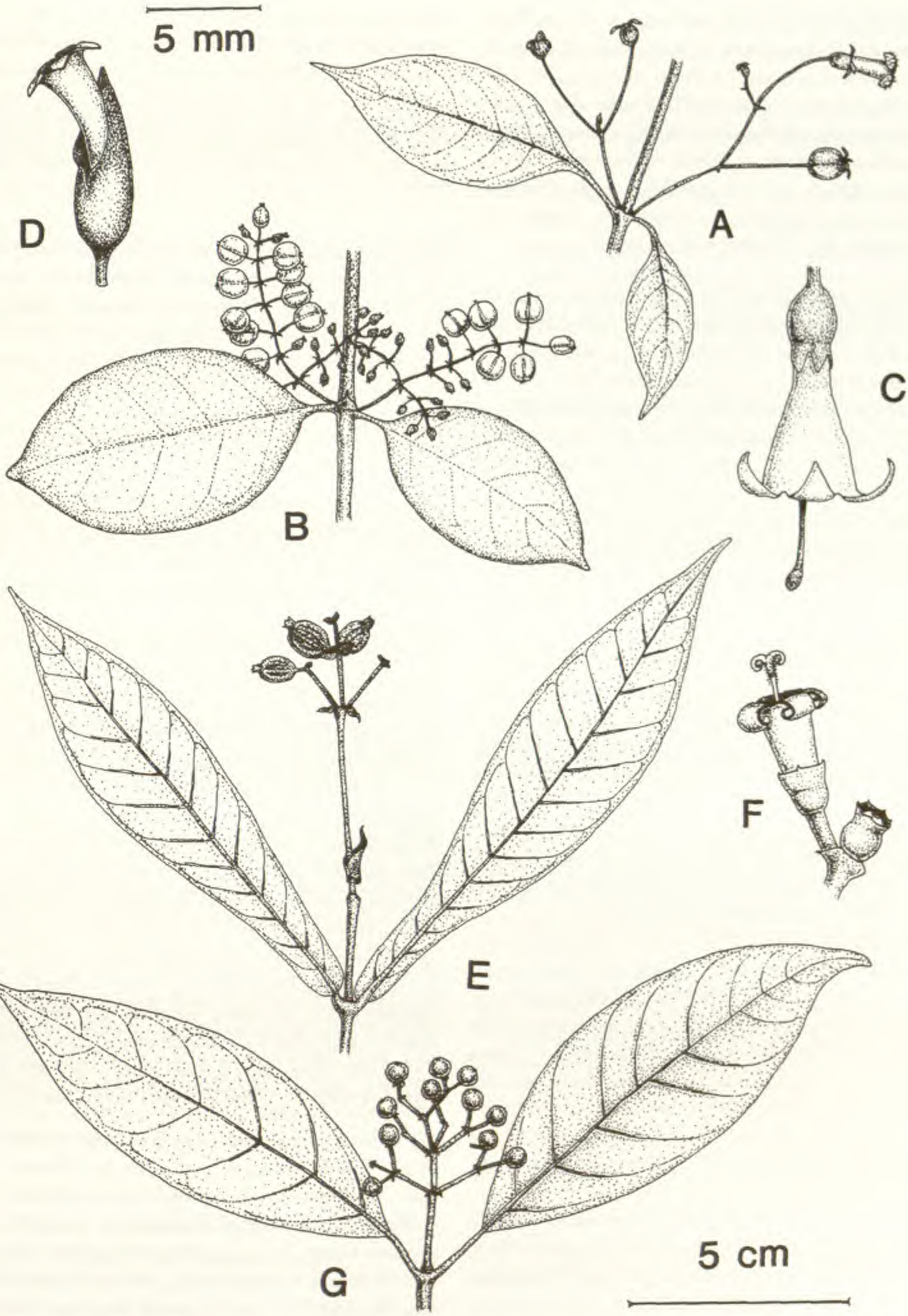


Figure 1. —A. *Manettia longipedicellata* C. M. Taylor (from *Grayum 1144*, DUKE), habit. B, C. *Chiococca caputensis* C. M. Taylor & D. H. Lorence. —B. Habit (from *McPherson 10012*, MO). —C. Flower (from *McPherson 9744*, MO). —D. *Pentagonia lobata* C. M. Taylor, flower (from *Hammel 18619*, MO). —E. *Psychotria burgeri* C. M. Taylor, habit (from *Haber 9778*, F). F, G. *Rudgea laevis* C. M. Taylor. —F. Flower (from *Haber 452*, MO). —G. Habit (from *Haber 1070*, MO). A, B, D, E, G to 5-cm scale; C, F to 5-mm scale.

throughout, tubes 38–46 mm long, 3–5 mm diam. at base, 10–15 mm diam. at apex, curved, lobes 5, deltoid, 4–8 mm long; *stamens* 5, included, filaments attached ca. ⅓ of length of tube above base, ca. 15 mm long, swollen and densely pilose to villous at attachment point, glabrous otherwise, anthers narrowly oblong, ca. 3.5 mm long; *style* included, ca. 2 cm long, stigmas 1, lanceolate, ca. 2 mm long; disk bilobed, ca. 1.5 mm high. *Fruit* not seen.

*Habitat and phenology*. Moist forest in the vicinity of Golfito and on the Osa Peninsula in the Golfo Dulce region of Costa Rica at 300–500 m. Collected in flower in July and December.

This species is included in *Pentagonia* based on its fleshy monocaulous habit (characteristic though not exclusive in this genus), relatively large, firm-textured leaves with the abaxial surface finely striate, and five-merous, relatively large, fleshy flowers borne in contracted axillary inflorescences. The finely striate texture of the abaxial leaf surfaces with the minor venation not at all visible seems to be unique to this genus.

*Pentagonia lobata* is distinguished within *Pentagonia* by its combination of pinnatifid leaves and a spathaceous calyx. Pinnatifid leaves also characterize *P. tinajita* Seemann of Costa Rica and Panama (here circumscribed to include *P. alfaroana* Standley and *P. gymnopoda* Standley), which can be separated by its regularly lobed calyx limb. A spathaceous calyx also characterizes *P. spathicalyx* K. Schumann of Amazonian Brazil, Ecuador, and Peru, which has elliptic entire leaves.

*Pentagonia* is poorly known taxonomically and ecologically. Individuals of most species are apparently infrequent, or at least infrequently collected, and good specimens are difficult to make due to the large fleshy leaves and flowers. Some species cannot be separated vegetatively. Flowering characteristics appear to be reliable for separating species, but flowering specimens are sometimes difficult to relate to fruiting specimens (the majority of collections). The range of size and shape variation seen in herbarium material is notable in some species, to 100% in some features (see descriptions in Burger & Taylor, 1993): this may be real morphological variation, or it may reflect variable shrinkage or other artifacts of the preparation of dried specimens. Some species of *Pentagonia* were originally separated based on details of leaf shape such as acute versus rounded leaf bases, but with more material available these conditions often show continuous variation and are not adequate to distinguish species. The deeply pinnatifid leaves found in some *Pentagonia* species are here regarded as a consistent character at the species level, although this has not been verified with field observations. Good taxonomic knowledge of *Pentagonia* will require extensive field-based study.

*Paratypes*. COSTA RICA. **Puntarenas:** Cantón de Osa, Reserva Forestal Golfo Dulce, Rancho Quemado, 8°42′00″N, 83°35′40″W, *Hammel et al. 18309* (CR, F, MO).

**Psychotria burgeri** C. M. Taylor, sp. nov. TYPE: Costa Rica. Puntarenas: Cantón de Puntarenas, Monteverde, along Quebrada Máquina, 10°18′N, 84°48′W, 12 Mar. 1990, *W. Haber 9778* (holotype, CR; isotypes, F, MO 4619858, US). Figure 1E.

A *Psychotria pleuropoda* J. Donnell Smith foliis subsessilibus basim rotundatis ad truncatis differt.

Small trees to 3 m tall, glabrous. *Leaves* narrowly elliptic to oblanceolate, 7–13 cm long, 1.4–3.6 cm wide, at apex acute to slightly acuminate, at base truncate to rounded, chartaceous, glabrous above and below; secondary veins 10–12 pairs, looping to interconnect in a rather straight submarginal vein, plane above, prominulous below, without domatia; *petioles* stout, 2–3 mm long, glabrous; *stipules* united around the stem, deciduous below distalmost 1–3 nodes, ovate, split along one side, 6–15 mm long, acute or frequently bilobed with the lobes acuminate, sometimes strongly costate, glabrous, ciliate. *Inflorescences* terminal, pyramidal; peduncles 2–4.5 cm long; panicles 2–3 cm long and wide, branched once, with bracts 3–4 mm long, triangular to ovate, ciliate, acute; *flowers* sessile in 3 glomerules of 3–5; hypanthium not seen; *calyx* limb green, glabrous, 1–1.5 mm long, lobed for ca. ⅓ of its length, lobes deltoid, acute, ciliolate; *corollas* not seen. *Infructescences* similar to inflorescences; *fruit* ellipsoid, 8–11 mm long, 6–12 mm diam., becoming red; *pyrenes* with 4–5 low rounded longitudinal ridges.

*Habitat and phenology*. Wet premontane forest at ca. 1400 m in the Cordillera de Tilarán, Costa Rica. Collected in flower and fruit in March.

*Psychotria burgeri* is placed in subgenus *Psychotria* based on its deciduous stipules, red fruits, and distinctive gray drying color. Subgenus *Psychotria* is well known in Central America (Hamilton, 1989), and even though its flowers have not been seen, this new species is clearly undescribed. It is similar to *P. pleuropoda* J. Donnell Smith of northern Central America, which can be separated by its leaves with acute to tapered bases and secondary veins 15–18 pairs, petioles 2–10 mm long, and elevational range of 50–500 m; *P. pleuropoda* is so far not known from Costa Rica. Range disjunc-

tions and disjunct species pairs between northern Central America and the Cordillera de Tilarán in Costa Rica are frequent in Costa Rican Rubiaceae (Burger & Taylor, 1993), although few are accompanied by habitat shifts such as this. The specific epithet honors William C. Burger, a long-time student of the flora and phytogeography of Costa Rica.

**Psychotria nebulosa** (Dwyer) C. M. Taylor, comb. nov. Basionym: *Coussarea nebulosa* Dwyer, Ann. Missouri Bot. Gard. 67: 131. 1980. TYPE: Panama. Chiriquí: Monte Rey near Boquete, 20 July 1971, *T. B. Croat 15868* (holotype, MO 2162999; isotype, MO 4043108).

*Rudgea chiriquiensis* Dwyer, Ann. Missouri Bot. Gard. 67: 476. 1980. Syn. nov. Not *Psychotria chiriquiensis* (Standley) C. M. Taylor & W. C. Burger, 1993. TYPE: Panama. Chiriquí: Cerro Colorado, along road above San Félix 29 km above bridge over Río San Félix (7.9 km above turnoff to Escopeta), 14 July 1976, *T. B. Croat 37071* (holotype, MO 2798805; isotype, MO 2389189).

Study of additional material available since the publication of *Coussarea nebulosa* and *Rudgea chiriquiensis* shows that they refer to the same species, and that this species is best placed in *Psychotria*. The inflorescences on the type specimens of *R. chiriquiensis* are older and consequently larger and relatively more open than those on the type specimens of *C. nebulosa*, but additional material shows this to be a developmental series, and no other features separate these specimens. The mature fruits are fleshy drupes 12–14 mm long with two hard, longitudinally ridged pyrenes. This fruit structure is characteristic of both *Psychotria* and *Rudgea* but excludes this species from *Coussarea*, which has smooth, thin-walled, usually solitary seeds in fleshy to leathery fruits. *Rudgea* is separated from *Psychotria* by its glandular-fimbriate stipules. The stipules of this species are shortly bidentate and not at all glandular, and it is here transferred to *Psychotria*.

*Psychotria nebulosa* belongs to subgenus *Heteropsychotria* Steyermark, which is characterized by green or gray-green drying color, persistent usually bidentate stipules, and blue or black mature fruits. The mature fruit color of *P. nebulosa* is not known. Based on inflorescence, stipule, and fruit morphology it seems closely related to *P. eurycarpa* Standley, which can be separated by its smaller leaves that are usually shiny on the adaxial surfaces and pyrenes that are longitudinally angled rather than ridged, and to *P. umbelliformis* Dwyer & M. V. Hayden, which is densely pilosulous throughout. *Psychotria nebulosa* is also similar in general aspect to *Coussarea austin-smithii* Standley, which can be distinguished by its subglobose to ellipsoid fruits with smooth to slightly angled, usually solitary seeds. *Psychotria nebulosa* appears to be restricted to Chiriquí and Veraguas provinces in western Panama.

**Psychotria roseocrema** (Dwyer) C. M. Taylor, comb. nov. Basionym: *Coussarea roseocrema* Dwyer, Ann. Missouri Bot. Gard. 67: 133. 1980. TYPE: Panama. Panamá: El Llano–Cartí highway, 6–10 km N of El Llano, 13 Apr. 1973, *R. L. Dressler 4334* (holotype, MO 2126258).

Additional material collected since the publication of this name shows that the fruits of this species are fleshy and blue-black at maturity with two hard, longitudinally ridged pyrenes. As discussed above, this fruit structure is characteristic of *Psychotria* but is not found in *Coussarea*, and accordingly this species is here transferred to *Psychotria*. *Psychotria roseocrema* belongs to subgenus *Heteropsychotria*.

*Psychotria roseocrema* is similar in general aspect to *P. umbelliformis*, which can be distinguished by its pilosulous pubescence throughout, and to *P. eurycarpa* and *Coussarea austin-smithii*, both of which lack the strong looping submarginal leaf veins found in *P. roseocrema*.

**Psychotria saltatrix** C. M. Taylor, sp. nov. TYPE: Costa Rica. Cartago: Refugio Nacional Tapantí, por la orilla del Río Grande de Orosi, 9°45′N, 83°47′W, 14 Aug. 1991, *B. Hammel et al. 18328* (holotype, CR; isotypes, F, MO 4619859). Figure 2.

A speciebus ceteris *Psychotriae* L. subg. *Psychotriae* foliis stipulis bracteis calycibusque majoribus etiam infructescentiis ut videtur axillaris differt.

Soft shrubs to 2 m tall; stems puberulous to hirtellous becoming glabrescent with age. *Leaves* elliptic, 18–32 cm long, 6.5–13.5 cm wide, at apex acute to acuminate with the tip ca. 1 cm long, at base acute to usually tapered, drying membranaceous, above glabrous, below glabrous on lamina but moderately to usually densely puberulous to pilosulous on veins; secondary veins 18–24 pairs, diverging from costa at 80–90° or more, usually looping to interconnect in an undulating to rather straight submarginal vein, with 1–2 secondary loops as well, plane above, prominulous below, without domatia; *petioles* 1.5–8 cm long; *stipules* interpetiolar, deciduous after 1–2 distal nodes, obovate, 25–35 mm long, 12–16 mm wide, acute, basal and central

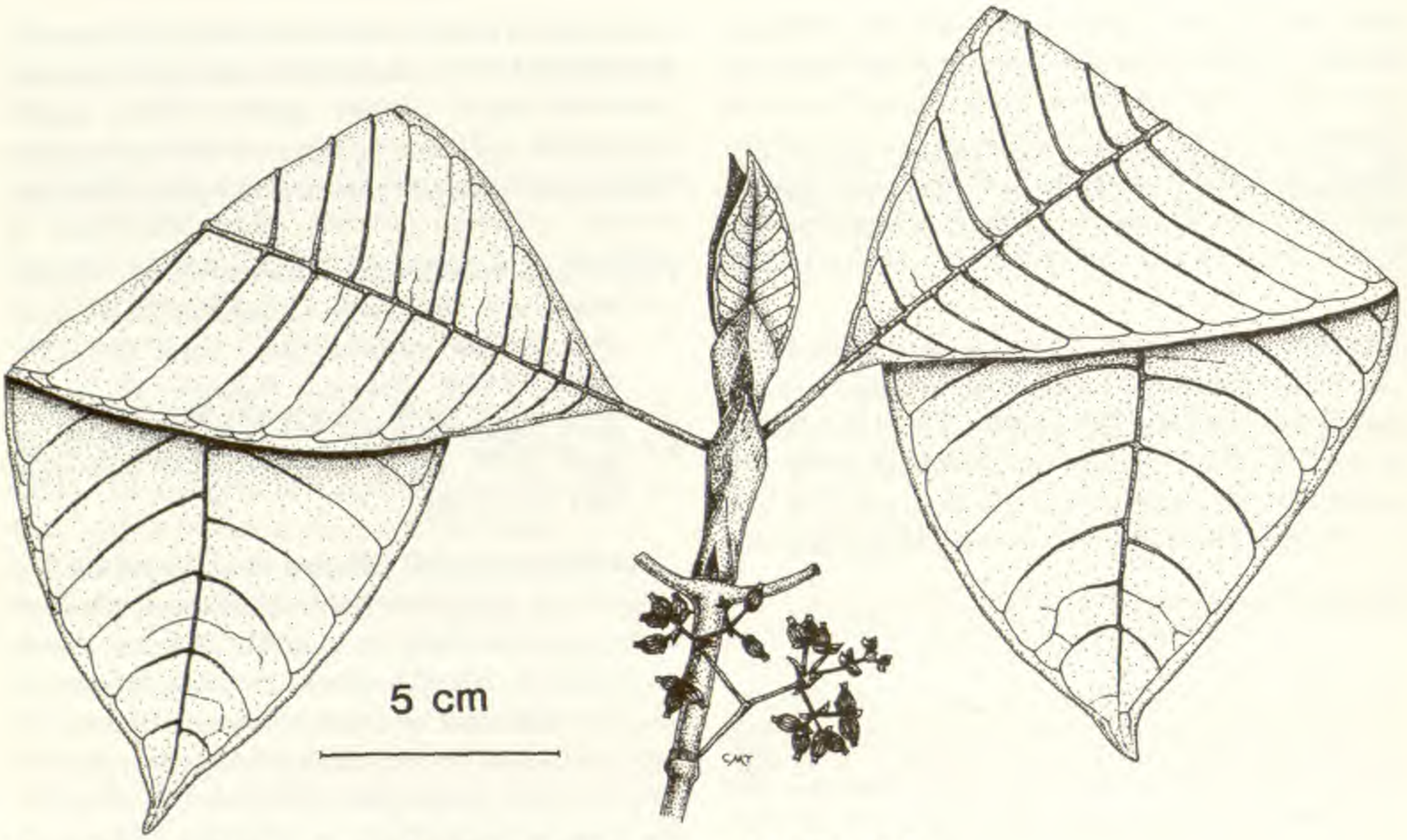


Figure 2. *Psychotria saltatrix* C. M. Taylor (from *Hammel 18030*, MO).

portion chartaceous to subcoriaceous and smooth, marginal portions membranaceous and with fine parallel veining, both portions puberulous or pilosulous becoming glabrescent. *Inflorescences* terminal, pyramidal; peduncles 3–60 mm; panicles 2–10 cm long, 4–12 cm wide, with branches spreading at ca. 80–90° or occasionally more, with 2 branches at the basalmost nodes or on larger inflorescences frequently 4 branches and then these generally similar in size but 2 spreading and 2 reflexed, puberulous to hirtellous, with bracts lanceolate, membranaceous, puberulous to glabrescent, ciliolate, acute, 2–10 mm long, those subtending primary branches 8–10 mm long and those subtending flowers 2–4 mm long; *flowers* sessile or very shortly stipitate in glomerules of 3–5, each subtended by 1–3 bracts; hypanthium turbinate, 1–1.2 mm long, glabrescent to puberulous; *calyx* limb green, glabrous to puberulous, 1.5–2 mm long, divided for ca. ⅓–½ its length, lobes 5, deltoid to ovate, ciliolate, acute; *corolla* salverform, white, externally glabrous or usually densely puberulous at top of tube, internally glabrous except densely pilose in 10 tufts at stamen attachment, tubes 2–3 mm long, 1–1.2 mm diam., lobes 5, ligulate, 2–3 mm long, somewhat thickened at apex in bud, becoming acute at anthesis; *stamens* 5, exserted, attached just below top of corolla tube, filaments 0.5–0.8 mm long, anthers oblong, ca. 1 mm long; *style* exserted, 3.5–4.5 mm long, stigma lobes 2, linear, ca. 0.5 mm long; disk annular, smooth, ca. 0.3–0.5 mm long. *Infructescences* overtopped by sympodial stem growth and appearing pseudoaxillary, as fruit matures usually displaced to 3rd or 4th node below apex, more expanded than inflorescences, to 12.5 cm long and 16 cm wide, bracts often deciduous; *fruit* with stipe ca. 0.5 mm long, obovoid, 6–6.5 mm long, 4–4.5 mm wide, puberulous to glabrescent, becoming orange to red; *pyrenes* with 4–5 rather sharp longitudinal ridges.

*Habitat and phenology*. Costa Rica to Colombia, in wet premontane and montane forest at 1250–2100 m. Collected in flower in May and August, in fruit January, July, September, and October.

*Psychotria saltatrix* is placed in subgenus *Psychotria* (Hamilton, 1989) based on its deciduous interpetiolar stipules, orange to red mature fruits, and distinctive gray-green to brown drying color. Within this subgenus it is distinguished by its apparently pseudoaxillary inflorescences, relatively large leaves and stipules, secondary veins that often diverge from the costa at more than a 90° angle and usually form a distinct submarginal vein, well-developed inflorescence bracts, relatively long calyx limbs, obovoid fruits, and very wet premontane or montane habitats. The inflorescences are terminal in position but the infructescences are typically overtopped by sympodial growth from one axil. This growth pattern is seen in other species of subgenus *Psychotria*, but is rarely as strongly or consistently developed as in this new species. Relatively few other species of subgenus *Psychotria* inhabit wet premontane or montane forest. In the two flowering collections seen, both the stamens and the style are

exserted in all of the flowers, and *P. saltatrix* may be homostylous. This condition (if actually present) would be highly unusual in the subgenus. The specific epithet refers to the occurrence of this species in widely separated wet cool sites in the Andean Cordillera, western Panama, and Costa Rica.

Three fruiting specimens from similar habitats in southern Colombia and Ecuador, *de Benavides 9292* (MO), *Sparre 17686* (S), and *Hoover 1993* (MO), are similar to *P. saltatrix* but can be separated by their shorter calyx limbs and bracts subtending the flowers, both ca. 1 mm long, secondary leaf veins 14–15 pairs, and stipules 5.5–6 cm long. These specimens may represent a separate, apparently unnamed taxon, or they may reflect clinal variation in *P. saltatrix*; no conclusion can be made without flowering material.

*Paratypes.* COLOMBIA. **Antioquia:** municipio de Valdivia, vereda San Fermín, sitio "Alto de Ventanas," 2 km al NE de la vía Medellín–Valdivia en la vía que conduce al municipio de Briceño, 7°50′N, 75°32′W, *Callejas et al. 10735* (F, HUA, MO); municipio de Valdivia, vereda San Fermín, cerca 120 km NE de Medellín, en la vía a Briceño, finca de Los Restrepo, 07°06′N, 07°32′W, *Callejas & Gómez 10913* (HUA, MO); municipio de Urrao, Parque Nacional Natural "Las Orquídeas," camino de Calles hacia Venados arriba, Sector Bellavista, *Cogollo et al. 5028* (JAUM, MO). **Nariño:** municipio Ricaurte, Reserva Natural La Planada, *Restrepo 637* (MO). COSTA RICA. **Cartago:** Tapantí, *I. Chacón et al. 1432* (CR, MO). **San José:** Parque Nacional Braulio Carrillo, Estación Zurquí, 10°03′30″N, 84°01′W, *Hammel et al. 18030* (CR, F, MO). PANAMA. **Chiriquí:** Cerro Colorado Mine, *Antonio 4878* (MO). **Darién:** Cerro Pirre, valley between Pirre and next most southerly peak, *Folsom 4441* (MO); Cerro Pirre, top of mountain and ridge just S of Pirre, *Folsom 4521* (MO).

**Rudgea laevis** C. M. Taylor, sp. nov. TYPE: Costa Rica. Puntarenas: Monteverde, Bajos de La Lindora, río Guacimal, 10°18′N, 84°48′W, 19 Feb. 1988, *W. Haber & E. Bello 8271* (holotype, CR; isotype, MO 3646480). Figure 1F, G.

A *Rudgea laurifolia* (Kunth) Steyermark venulis paucioribus calycibus corollisque minoribus differt.

Shrubs or small trees to 6 m tall; stems to 15 cm DBH, glabrous. *Leaves* elliptic, 5.5–12 cm long, 1.8–5.5 cm wide, at apex acute, at base cuneate to obtuse, drying chartaceous, glabrous above and below; secondary veins 4–7 pairs, not looping to interconnect, above plane to somewhat sulcate, below prominulous, usually with foveolae in axils; *petioles* glabrous, 4–12 mm long; *stipules* glabrous, united around stem into a persistent continuous truncate sheath 1.5–2 mm long bearing on each side 1 caducous deltoid gland ca. 1 mm long and wide. *Inflorescences* terminal, pyramidal to somewhat rounded, green, pilosulous to glabrescent; peduncles 1.5–3 cm long; panicles 2.5–3 cm long, 4–8 cm wide, with bracts 0.5–1 mm long, deltoid, obtuse; *flowers* sessile in dichasial cymes of 5–9, with hypanthium turbinate, ca. 1 mm long, glabrous; *calyx* limb green, glabrous, 0.3–0.5 mm long, subtruncate to 5-denticulate; *corolla* salverform, white, glabrous externally and internally except barbate in throat; tube 3–4 mm long, 1–2 mm diam.; lobes 5, ligulate, 3–4 mm long, acute, unappendaged; *stamens* 5, exserted, attached just below top of corolla tube, filaments 0.8–1 mm long, anthers ca. 2 mm long, narrowly oblong; *style* exserted, 6–6.5 mm long, puberulous in distal portion, stigma lobes 2, linear, ca. 1 mm long; disk annular, smooth, ca. 0.5 mm high. *Infructescences* similar in size, proportion, and color to inflorescences; *fruit* globose, 6–10 mm diam., glabrous, white; *pyrenes* smooth.

*Habitat and phenology.* Costa Rica, in wet premontane and lower montane forest of Cordillera de Tilarán at 1000–1400 m. Collected in flower in February and April, in fruit June, September, and November.

This new species is similar in aspect to *Rudgea laurifolia* (Kunth) Steyermark, which can be distinguished from *R. laevis* by its several to numerous acicular stipular glands, more numerous secondary leaf veins (9–11 pairs), longer calyx limb (2.5–2.7 mm long), longer corolla tube (ca. 7.5 mm long), shortly appendaged corolla lobes, and lowland wet forest habitat. *Rudgea laurifolia* is known only from the basins of the Ríos Negro and Orinoco in South America.

*Paratypes.* COSTA RICA. **Alajuela:** Reserva Biológica Monteverde, Finca Ston's, 10°19′N, 84°43′W, *Obando 140* (CR, MO). **Puntarenas:** Monteverde comunidad, 10°18′N, 84°48′W, *Bello 4* (CR), *Haber 452* (MO), *1070* (MO).

*Acknowledgments.* I thank the curators of CR, DUKE, F, and HUA for making specimens available for study; R. Callejas for facilitating fieldwork in Antioquia, Colombia; R. E. Gereau for revision of the Latin diagnoses; and W. C. Burger, M. Grayum, B. Hammel, D. Lorence, and W. D. Stevens for helpful comments. Travel related to this work was supported in part by the National Science Foundation (BSR 87-00068).

Literature Cited

Burger, W. B. & C. M. Taylor. 1993. Flora Costaricensis: Rubiaceae. Fieldiana, Bot. n.s. 33: 1–333.

Hamilton, C. 1989. A revision of Mesoamerican *Psychotria* subg. *Psychotria* (Rubiaceae). Ann. Missouri Bot. Gard. 76: 67–111, 386–429, 886–916.

# Erratum

Yen, Chi & Jun-liang Yang. 1994. *Roegneria tridentata*, a new species of Triticeae (Poaceae) from Qinghai, China. Novon 4: 310–313.

On page 313, first column, four lines from bottom should read "Chromosome 19 has a large satellite, and chromosome 21 has a very short arm connected with a small satellite."

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# Novelties and Notes in North American *Aristida* (Gramineae)

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ABSTRACT. New taxa of *Aristida* include three related to *A. schiedeana* Trinius & Ruprecht (*A. petersonii* sp. nov., *A. eludens* sp. nov., and *A. spanospicula* sp. nov.) and one variety of *A. purpurea* Nuttall (var. *perplexa* var. nov.). Two species are reduced in rank (*A. schiedeana* var. *orcuttiana* [Vasey] comb. nov. and *A. purpurea* forma *brownii* [Warnock] comb. nov.), and one species is reinstated (*A. curvifolia* Fournier). A key is given for the *A. schiedeana* complex.

RESUMEN. Nuevos taxa de *Aristida* que incluyen tres especies con las aristas laterales reducidas, relacionadas con *A. schiedeana* Trinius & Ruprecht (*A. petersonii* sp. nov., *A. eludens* sp. nov., y *A. spanospicula* sp. nov.) y una variedad con las aristas laterales desarrolladas de *A. purpurea* Nuttall (var. *perplexa* var. nov.) son descritos. Dos especies son reducidas en rango (*A. schiedeana* var. *orcuttiana* [Vasey] comb. nov. y *A. purpurea* forma *brownii* [Warnock] comb. nov.) y una especie es reinstalada (*A. curvifolia* Fournier). Una clave para el complejo *A. schiedeana* es presentada.

The genus *Aristida* (Arundinoideae: Aristideae) comprises approximately 300 species found throughout the world, but its members are particularly frequent in warm, semiarid environments. Many species have three awns terminating the single floret, but it is not uncommon to find single-awned relatives of three-awned taxa. Species are notorious for their taxonomic difficulty, due partly, we believe, to undescribed variation that obscures the taxonomic boundaries. Major revisionary efforts include those of Henrard (1927, 1928, 1929) and Hitchcock (1924, 1935).

**Aristida petersonii** Allred & Valdés-Reyna, sp. nov. TYPE: Mexico. Oaxaca: 7.7 km NW of Tlaxiaco on road to San Juan Mixtepec, steep slopes with *Pinus*, *Quercus*, and *Arbutus*, elev. 2020 m, 2 Sep. 1990, *P. M. Peterson & A. Campos-Villanueva 9731* (holotype, NMCR; isotypes, ANSM, US). Figure 1.

Species nova propria vaginis lanosis, glumis glabris et valde inversis (primis secundis longioribus), paniculis angustis, rostris tortis lemmatum, et aristis singularibus a congeneribus Americanae borealis diversa.

*Plants* perennial, tufted; *culms* 50–100 cm tall, erect, unbranched except for basal tillering; *internodes* glabrous, striate, terete. *Sheaths* striate, shorter than the internodes, rounded on the back, loosely lanose, the hairs curling and tangled, the upper sheaths sparsely lanose to glabrous; *collars* often with a tuft of longer cobwebby hairs at the corners; throat glabrous except for the ligule. *Ligules* a minute fringe of hairs less than 0.5 mm long. *Blades* glabrous, flat when fresh and mature (new leaves convolute), folded upon drying, 15–30 cm long, 2–2.5 mm wide when flat, the lateral nerves generally coalescent and the margin thickened, the

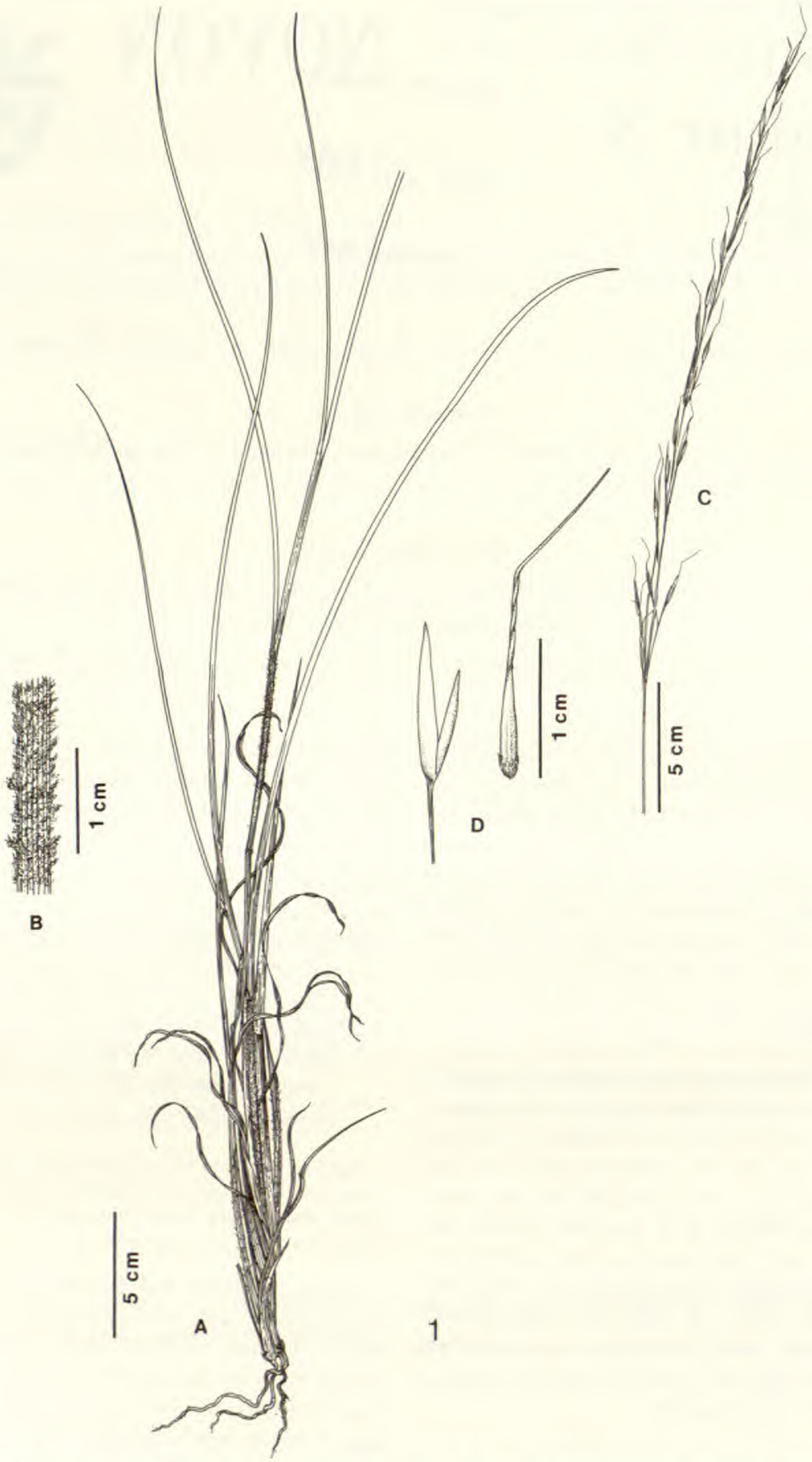


Figure 1. *Aristida petersonii* Allred & Valdés-Reyna (*Peterson & Campos-Villanueva 9731*). —A. Vegetative habit. —B. Sheath pubescence. —C. Inflorescence. —D. Spikelet: glumes left, floret right.

Figure 2. Geographic distributions of *Aristida petersonii* Allred & Valdés-Reyna (stars), *A. eludens* Allred & Valdés-Reyna (closed circles), and *A. spanospicula* Allred & Valdés-Reyna (squares).

marginal veins ca. 0.5 mm wide. *Panicles* 20–30 cm long, narrow, contracted, erect, the nodes glabrous; *primary branches* few, single or paired at the nodes, erect to appressed, 4- to 8-flowered, the lower ones 6–12 cm long; *secondary branches* weakly developed, 2- to 3-flowered, appressed; *pulvini* absent in the axils of the primary and secondary branches and pedicels, the spikelets thus appressed along the branches and main axis. *Glumes* glabrous, inverse, membranous and sub-hyaline, 1-nerved, light tan to purplish, the apices acute but not awned, the second glume ½ to ⅔ the length of the first; *first glume* (9–)10–13 mm long; *second glume* 6–7 mm long. *Lemmas* glabrous, mottled, 7–8 mm long from the base of the callus to the twisted portion of the beak; *beak* prominently twisted, (4–)5–6 mm long; *central awn* not twisted, geniculate-bent, 7–9 mm long; *lateral awns* completely reduced, represented by tiny points ca. 0.1 mm long at the end of the beak; *callus* ca. 0.5 mm long, with straight hairs to 1 mm long. *Palea* completely enclosed by the lemma, 2-nerved, hyaline, obtuse to rounded, 1–1.5 mm long. *Lodicules* 2, flabellate, 1–1.5 mm long. *Caryopsis* fusiform, chestnut-brown, 4.5–5.5 mm long.

*Flowering* known only from September, but presumed August–October. *Distribution.* Pine/oak/juniper woodlands; Mexico, known only from south-central Oaxaca (Fig. 2).

The specific epithet, *petersonii,* honors the collector of this species, Paul M. Peterson of the Smithsonian Institution.

*Aristida petersonii* is one of three perennial species in North America with lanate or floccose sheaths, the other two being *A. lanosa* Muhlenberg ex Elliott and *A. scribneriana* A. S. Hitchcock. *Aristida lanosa,* of the southeastern United States, differs in having sheaths mostly longer than the internodes, blades 2–6 mm wide, panicles mostly 30–70 cm long with lanose tufts in the branch axils, longer glumes (though they share the inverse position), and three well-developed awns. *Aristida scribneriana,* of the central highlands of Mexico, differs in having lanose internodes (including the peduncles) and blades (both surfaces), sparsely vil-

lous glumes that are nearly equal in length, and normally three well-developed awns. Other single-awned *Aristida* with narrow panicles that have glabrous (or very sparsely pilose) sheaths and equal glumes are *A. eludens*, *A. spanospicula*, and epulvinate forms of *A. pansa*. *Aristida petersonii* is the only North American *Aristida* with lanose sheaths, narrow panicles, glabrous glumes in the inverse position, and single-awned spikelets.

*Paratypes.* MEXICO. **Oaxaca:** 24.5 km W of Tlaxiaco and 7.4 km NE of San Juan Mixtepec, gravelly slopes with *Pinus, Quercus, Arbutus* and scattered *Juniperus*, elev. 2220 m, 3 Sep. 1990, *P. M. Peterson & A. Campos-Villanueva 9746* (ANSM, NMCR, US).

### *Aristida schiedeana* Trinius & Ruprecht Complex

The *Aristida schiedeana* complex includes *A. schiedeana*, *A. orcuttiana* Vasey, *A. laxa* Cavanilles, and the two new species *A. eludens* and *A. spanospicula*. This complex is characterized by having flat blades often curling like wood shavings, generally equal glumes, a twisted lemma beak, and single awns (except *A. laxa*). Its members are customarily found as sparse understory in pine/oak forests of the Mexican and Central American central cordilleran mountain ranges.

**Aristida eludens** Allred & Valdés-Reyna, sp. nov. TYPE: Mexico. Coahuila: San Lorenzo Canyon, ca. 8 km S of Saltillo, mountain scrub grassland vegetation with *Berberis, Bouteloua, Hilaria, Dasylirion*, very rocky sandy loam, flat bajada on N-facing side of canyon, 6000 ft. (1830 m), 3 Sep. 1991, *J. Valdés-Reyna 2254* (holotype, ANSM; isotype, NMSU). Figure 3.

Species nova laminis ubi vivis planis vel plicatis laxe, paniculis angustis absque pulvinis axillaribus praeter interdum ramos infimos, glumis subaequalibus, et aristis singularibus a congeneribus Americanae borealis diversa.

*Plants* perennial, tufted; *culms* (35–)40–65(–80) cm tall, erect, branching only at the base; *internodes* terete, glabrous. *Leaves* basal and cauline, light green. *Sheaths* longer than the internodes, glabrous or scaberulous except for the summit, rounded on the back; *collars* with a tuft of cobwebby hairs at the corners (becoming glabrous upwards), sometimes with a line of minute hairs across the back; *throat* glabrous or puberulent. *Ligules* a fringe of hairs 0.2–0.3 mm long. *Blades* flat or loosely folded when fresh, rolled upon drying, glabrous or scaberulous abaxially, puberulent or glabrate adaxially especially toward the base, 12–35 cm long, 1–1.5 mm wide when flat. *Panicles* 10–22 cm long and 1–2 cm wide, with 16 or more spikelets, narrow, contracted, the nodes glabrous; *primary branches* erect, appressed to the main axis except occasionally the lowermost branch divaricate, naked at the base, the lower ones 5–9 cm long; *pulvini* absent, the spikelets appressed, only occasionally present in the axil of the lowermost branch and causing it to spread from the axis. *Glumes* glabrous, brownish, subequal or the first slightly shorter or longer, 1-nerved, 8–13 mm long, the apices acute and often with a mucro. Lemmas glabrous, mottled, 10–13 mm long from the base of the callus to the divergence of the awns; *beak* twisted, (3–)4–5 mm long; *central awn* not twisted, geniculate-bent, 5–10 mm long; *lateral awns* highly reduced, erect, 0.1–3 mm long; *callus* 0.5–1 mm long with stiff hairs ca. 1 mm long. *Paleas* completely enclosed by the lemma, 2-nerved, hyaline, rounded, ca. 1 mm long, shorter than the lodicules. *Stamens* 3, the anthers 2–2.5 mm long. *Lodicules* 2, flabellate, 1–1.5 mm long. *Caryopses* fusiform, chestnut-brown, ca. 6 mm long.

*Flowering* April–May, August–November. *Distribution.* Desert scrub/grassland habitats in calcareous soil, but extending up into the pine/oak zones; Mexico, in the states of Chihuahua, Coahuila, Durango, Guanajuato, Nuevo León, Oaxaca, Querétaro, and San Luis Potosí (Fig. 2).

The epithet *eludens* refers to the tendency of plants of this species to grow only within the branches and foliage of protective shrubs, evading, as it were, grazing animals.

*Aristida eludens* is the desert scrub/grassland representative of the *A. schiedeana* complex. *Aristida eludens* is distinguished most easily from the other species of the complex by possessing contracted panicles where the primary branches lack pulvini; it also differs by having cauline leaves with non-coiling blades and by the habitat. *Aristida eludens* occurs mostly in the desert scrub and semi-desert grasslands of northern Mexico, and only infrequently extends into the lower reaches of adjacent pine/oak communities. It has not been found to grow sympatrically with any of the other species of the complex. Consistent with the other members of the complex, its blades are nearly always flat or only loosely folded in the natural state (this may be obscure in dried specimens), though they do not coil like wood shavings. The flat blades contrast with the tightly involute blades of sympatric *A. pansa* Wooton & Standley and *A. purpurea* Nuttall s.l. Although the panicles of *A. eludens* usually lack pulvini and are thus narrow and contracted, it is not uncommon to find an isolated plant or

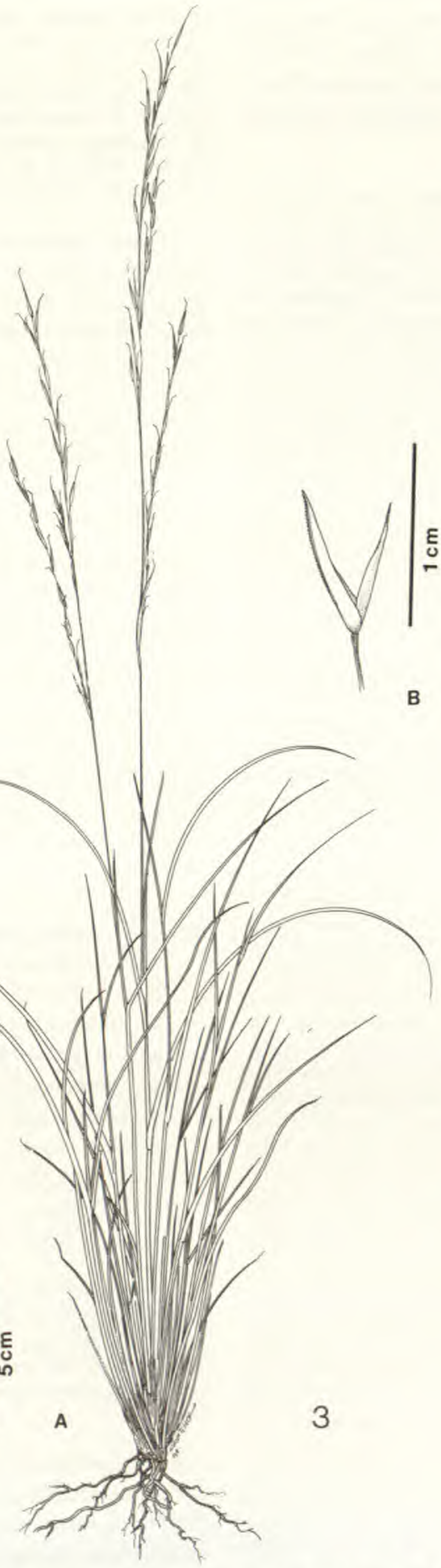


Figure 3. *Aristida eludens* Allred & Valdés-Reyna (*Valdés-Reyna 2254*). —A. Habit. —B. Spikelet: glumes left, floret right.

two in each population with only the lowermost branch spreading from a single axillary pulvinus. Only one individual from northern Coahuila (*Ibarra s.n.*) has been found to be completely pulvinate (pulvini in all axils).

*Paratypes.* MEXICO. **Chihuahua:** Sierra Carrasco, ca. 31 mi. NW of Julimes, 6000 ft., 15 Sep. 1973, *J. Henrickson 12965.5* (TEX/LL); Santa Eulalia Mts., 10 Sep. 1885, *C. G. Pringle 386* (TEX/LL); La Campana, 1650 m, 7 Sep. 1973, *J. Valdés-Reyna 148* (TAES). **Coahuila:** Sierra de la Paila (lado norte), cañada becerros, 1700 m, 13 Oct. 1989, *J. A. Villarreal 5469* (ANSM); 12 km al W de Saltillo, carr. 40, 2000 m, 9 July 1983, *J. Valdés-Reyna & L. Rodriguez 1522* (ANSM); San Lorenzo Canyon, ca. 8 km S of Saltillo, mountain scrub grassland vegetation with *Berberis, Bouteloua, Hilaria, Dasylirion*, very rocky sandy loam, flat bajada on N-facing side of canyon, anthers 1.5 mm, 6000 ft. (1829 m), 3 Sep. 1991, *K. W. Allred & J. Valdés-Reyna 5488, 5491, 5492, 5495, 5497* (ANSM, NMCR); Est. Carneros, Carneros Pass, steep hills W of town, very rocky calcareous soil along cobble road to microwave tower, desert grassland/scrub vegetation with *Yucca carnerosana, Agave, Nassella, Aristida curvifolia*, 6750 ft. (2057 m), 5 Sep. 1991, *K. W. Allred & J. Valdés-Reyna 5527, 5528* (ANSM, NMCR); Sierra Garcia, San Lazaro Pass, desert mountain scrub vegetation with ocotillo, lechuguilla, *Acacia*, and *Opuntia*, limestone N-facing steep slopes, 1200 ft. (366 m), 6 Sep. 1991, *K. W. Allred & J. Valdés-Reyna 5540* (ANSM, NMCR); San Lorenzo Canyon, 25 Aug. 1981, *S. L. Hatch 4501* (ANSM, TAES); Carneros, camino a torre de microondas, 3 km al poniente de la estación, 30 km al S de Saltillo, matorral de *Yucca carnerosana, Pinus cembroides, Dasylirion cedrosanum, Ceanothus greggii, Nassella tenuissima*, 17 Oct. 1986, *J. Espinosa-A. 97, 186* (ANSM, NMCR); San Lorenzo Canyon, 22 Aug. 1980, *M. Madrigal-A. s.n.* (TAES); Sierra de Parras en Los Chupaderos, 14 Apr. 1981, *A. Rodriguez s.n.* (CIIDIR-DURANGO); Estación Carneros, camino torre de microondas, 2100 m, 24 May 1982, *J. Valdés-Reyna 1456* (TAES, US); 18 mi. S of Saltillo on hwy. 54, just W of Est. Carneros, 2250 m, 18 Oct. 1989, *P. Peterson 8416* (ANSM, US); Cañon San Lorenzo, 1900 m, 22 Aug. 1980, [no collector] (TAES); Mpio. Arteaga, 10 mi. NE of hwy. 57 at Los Alpes, with pinyon, *Yucca, Agave*, 24 Aug. 1983, *S. L. Hatch 5022* (ANSM, NMCR, TAES); Mpio. Saltillo, Cerro del Pueblo, al W de la ciudad de Saltillo, 11 Sep. 1990, *J. Valdés-Reyna 2055* (ANSM, NMCR); Mpio. Ocampo, Rancho La Rueda, *D. Ibarra s.n.* (ANSM). **Durango:** 45 km WNW of Huejuquilla El Alto, 1830–2150 m, 23 Oct. 1983, *D. E. Breedlove 59212* (CAS, MO). **Guanajuato:** 30 km SE of San Felipe on hwy. 37 to León, rocky slopes in open grassland, 2290 m, 30 Aug. 1990, *P. M. Peterson 9693* (ANSM, NMCR, US); oak slopes ca. 12 mi. on rd. between Guanajuato and Santa Rosa, 30 Sep. 1946, *H. E. Moore, Jr. 1351* (US). **Oaxaca:** 19.5 km NW of Tlaxiaco and 12.3 km NE of San Juan Mixtepec, near jct. of road to Yosonama, sandy slopes with pine, oak, and manzanita, 2410 m, 3 Sep. 1990, *P. M. Peterson 9736* (ANSM, NMCR, US). **Nuevo León:** near Puerto México along hwy. 57, 22 Aug. 1983, *S. L. Hatch 5011* (ARIZ, TAES). **Querétaro:** 5 km al NE de Bernal, sobre la carretera a Tolimán, ladera caliza con vegetación de matorral xerófilo, 1950 m, 10 Nov. 1988, *Rzedowski s.n.* (ANSM, NMCR). **San Luis Potosí:** Mpio. Villa de Arriaga, Cerro del Gallo, 2500 m, 3 Oct. 1962, *E. Herndandez-X. 1413* (ANSM); mountain slopes, 13 mi. S of San Luis Potosí, 7100 ft., 2 Sep. 1939, *F. Shreve 9307* (US); near village of San Francisco in Sierra de San Miguelito, ca. 25 km SW of San Luis Potosí, pine/oak, 22–2400 m, 5 Sep. 1954, *E. R. Sohns 1062* (US); Cnyn. del Muerto, ca. 3 km W of Rodrigo, in Sierra de San Miguelito, 1800–2200 m, 18 Sep. 1954, *E. R. Sohns 1317* (US); ca. 5 mi. SW of city in hills, 18 July 1950, *J. R. Reeder 1372* (ARIZ).

Several specimens from central Mexico approach *Aristida eludens* in having single awns and narrow panicles, but differ in being very tall (to 1.5 m) robust plants with knotty bases and curling blades, and in occurring in oak and pine/oak forests. They are here excluded from *A. eludens* and are tentatively considered aberrant forms of plants normally with spreading panicle branches. Duplicates of some of these were referred by McVaugh (1983) to *A. schiedeana* or *A. laxa.*

Excluded from *A. eludens:* MEXICO. **Jalisco:** Autlán, 1290 m, 5/XI/1975, *C. Castro 84* (MEXU); near Villa Guerrero, Cerro del Aquila, 25 Sep. 1980, *A. Beetle 5811* (MEXU); Paso de la Troje, near km 36, SW of Ojuelos on rd. to Aguascalientes, 2100–2300 m, 9–12 Aug. 1958, *R. McVaugh 16818* (US); Rio Blanco, 6 Oct. 1886, *E. Palmer 476* (MO); Rio Blanco, June–Oct. 1886, *E. Palmer 517.5* (US); Rio Blanco, June–Oct. 1886, *E. Palmer 769* (US); Mpio. Mezquitic, 5 km E of Rancho El Mortero, pine/oak, 2200 m, 5 Nov. 1963, *Rzedowski 17687* (US). **Morelos:** Alarcán, 31 Aug. 1910, *C. Orcutt 3863* (MO). **Puebla:** 35 km de Tetela, 1550 m, 1/VIII/1981, *S. Contreras 534* (MEXU).

**Aristida spanospicula** Allred, Valdés-Reyna & Sánchez-Ken, sp. nov. TYPE: Mexico. Chihuahua: Sierra Madre Occidental, at Cuesta Prieta, along road from San Juanito to Creel, 3.1 mi. S of San Juanito, pine forest with scrub oak understory of *Lupinus, Muhlenbergia*, and *Trisetum*, thin forest loam calcareous soil, numerous clumps among the scrub oak, 7500 ft. (2280 m), 22 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5787* (holotype, NMCR; isotypes, ANSM, NMC, TAES). Figure 4.

Species nova *Aristidae schiedeanae* affinis laminis planis saepe torsivis scobiformibus, paniculis angustis absque pulvinis axillaribus, spiculis paucis dispersis late, glumis magnis spadiceis, rostris exsertis tortis lemmatum, et aristis singularibus a congeneribus Americanae borealis diversa.

*Plants* perennial, tufted; *culms* (20–)25–55(–60) cm tall, ascending, slender, not branching above the base; *internodes* terete, glabrous to minutely scaberulous. *Leaves* basal, light green to yellowish green. *Sheaths* longer than the internodes, glabrous to sparsely pilose, rounded on the back; *collars* glabrous to sparsely pilose at the corners, lacking a line of hairs across the back; *throats* glabrous ex-

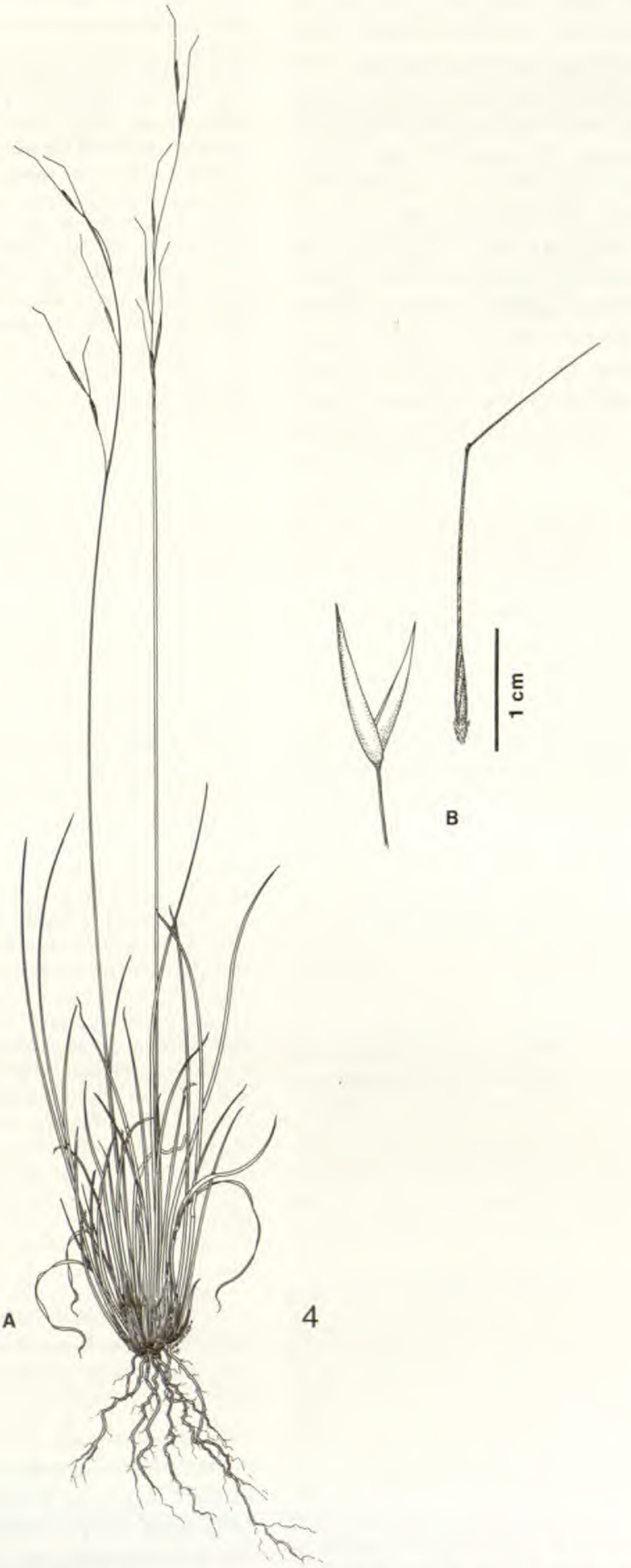


Figure 4. *Aristida spanospicula* Allred & Valdés-Reyna (*Allred 5787*). —A. Habit. —B. Spikelet: glumes left, floret right.

cept for the ligule. *Ligules* a fringe of hairs less than 0.5 mm long. *Blades* flat to loosely folded when fresh, rolled upon drying, usually coiling like wood shavings in age, glabrous abaxially, glabrous to puberulent adaxially, 14–25 cm long, 1.5–2 mm wide when flat, the margins thickened by the coalescence of the outer veins. *Panicles* (8–)12–22 cm long, 1–2 cm wide, few flowered with 3–8(–12) spikelets, often drooping, narrow but loose, the nodes glabrous; *primary branches* weakly developed, appressed-erect, bearing 1–2(–4) spikelets; *pulvini* absent. *Spikelets* few and widely spaced, scarcely overlapping, the pedicels often drooping and somewhat capillary. *Glumes* glabrous to scaberulous, mostly 1-nerved, occasionally a short lateral nerve developed, brownish, subequal or the first 1–2 mm shorter or longer, 9–15 mm long. *Lemmas* glabrous, (16–)18–22(–25) mm long from the base of the callus to the divergence of the awns; beak twisted, exserted beyond the glumes, (6–)8–10(–15) mm long; *central awn* not twisted, geniculate-bent at ca. 90°, 10–16(–20) mm long; *lateral awns* highly reduced, erect, less than 0.5 mm long; *callus* 0.5–1 mm long with stiff hairs less than 1 mm long. *Paleas* completely enclosed by the lemmas, 2-nerved, membranous, ca. 1 mm long, shorter than the lodicules. *Stamens* 3, the anthers light brown, ca. 2 mm long. *Lodicules* 2, flabellate, 1–1.5 mm long. *Caryopses* fusiform, brown, 7–9 mm long.

*Flowering* August–October. *Distribution.* As yet, found only in pine/oak forests of the Sierra Madre Occidentale, often on nearly bare ground, usually rocky or crumbly calcareous soil; Mexico, in the states of Chihuahua, Durango, and Sonora (Fig. 2).

We are pleased to cooperate with Jorge Sánchez-Ken, of the Herbario Nacional de México (MEXU), in describing this new species. The epithet *spanospicula* alludes to the panicles with few spikelets.

*Aristida spanospicula* differs from others in the complex by the epulvinate panicle, fewer spikelets, and longer lemmas. It is apparently restricted to the pine/oak forests of the Sierra Madre Occidental in northern Mexico. *Aristida spanospicula* occasionally grows intermingled with *A. schiedeana*, and some of the sympatric populations contain intermediate plants suggesting hybridization or incomplete morphological delineation of the species. The latter would not be uncommon in *Aristida*.

*Paratypes.* MEXICO. **Chihuahua:** ca. 6 mi. S of Creel, rocky outcrops near small stream, in ponderosa pine community with 5-needle pine and juniper, sandy loam soil, 22 Aug. 1985, *K. W. Allred 3074* (NMCR); Cascada Basaseachic Overlook on S side of canyon, very steep N-facing slopes in oak/pine forest, with *Quercus crassifolia*, *Arbutus*, 6600 ft. (2012 m), 11 Sep. 1987, *K. W. Allred 4607* (NMCR); 4 mi. W of Cuesta Blanca in the Sierra Brena, approximately 32 road mi. SW of Col. Juarez, pine-oak woodland with a very sparse understory, rocky gravelly soil, 6500 ft. (1981 m), 21 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5745, 5746* (NMCR); Sierra Madre Occidental, 11 mi. W of Babicora on hwy. 180 to Madera, pine-oak forest with sparse grass understory of *Bouteloua, Muhlenbergia, Piptochaetium*, rocky loam soil, 6800 ft. (2072 m), 22 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5776* (ANSM, NMCR); Sierra Madre Occidental, at Cuesta Prieta, along road from San Juanito to Creel, 3.1 mi. S of San Juanito, pine forest with scrub oak understory of *Lupinus, Muhlenbergia*, and *Trisetum*, thin forest loam calcareous soil, approaching *A. schiedeana*, 7500 ft. (2280 m), 22 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5792* (ANSM, NMCR); Cusarare, S of Creel, 14 Sep. 1973, *Bye, R. 5047* (TEX/LL); Sánchez, rocky pine woods, 8000 ft., 12 Oct. 1910, *A. S. Hitchcock 7671* (US); Chuhuichupa, Aug.–Sep. 1936, *Lesueur 6112* (CAS, MO, TEX/LL); Colonia Cumbres de Majalca, approx. 32 km W of hwy. 45 N of Chihuahua, table rock and rocky slopes with oak, pine, juniper, and *Arctostaphylos*, 23 Sep. 1988, *P. M. Peterson 5810* (ANSM, NMCR, US); 43.5 km W of Balleza and 51.6 km E of Guachochi, sandy, clay flats with pine, oak, and *Arctostaphylos pungens*, 2320 m, 18 Sep. 1991, *P. M. Peterson et al. 10756* (ANSM, NMCR, US); Parque Nacional Barranca del Cobre, 24.8 km NE of La Bufa on road to Samachic, gentle slopes in forest of pine, oak, and *Arbutus*, 2440 m, 20 Sep. 1991, *P. M. Peterson et al. 10799* (ANSM, NMCR, US); pine-oak region, Sierra Madre occidental, W of Casas Grandes, 3 mi. W of Cuesta Blanca, 2073 m, 4 Sep. 1958, *J. R. & C. G. Reeder 3214* (ARIZ, US). **Durango:** Sierra Madre Occidental, mountains E of Durango City, approximately 30 mi. E of the city at the movie set for "Fat Man and Little Boy," deep barrancas in pine/oak/manzanita communities, soil chalky, calcareous, very crumbly, 7500 ft. (2286 m), 24 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5831, 5837* (ANSM, NMCR); Sierra Madre Occidental, along hwy. 40 from Durango City to El Salto, 30 mi. W of Durango, pine/oak/arctostaphylos woodland with thick grass understory of *Muhlenbergia, Trachypogon*, slight slope, loam soil, 8400 ft. (2560 m), 24 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5845* (ANSM, NMCR); Sierra Madre along hwy. 40 from Durango City to El Salto, 32 mi. W of Durango, adjacent to Parque El Tecuan, pine savannah parkland with 5-needle pine, gently W-facing slope, grass understory of *Aristida, Panicum*, forest loam soil, 8000 ft. (2438 m), 24 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5851* (ANSM, NMCR). **Sonora:** E of Cananea, pine woods, Sierra de los Ajos, 26 Sep. 1981, *A. A. Beetle 7859* (MO).

The relationship of *A. schiedeana* and *A. orcuttiana* has long been problematical. Dávila & Sánchez-Ken (1994), Gould & Moran (1981), and Pohl & Davidse (1994) treated the two as conspecific without distinction; Henrard (1927, 1928, 1929) treated the two as distinct species; Hitchcock treated them both ways (conspecific in 1924, distinct in 1935); and Beetle (1983) presumably treated the two as conspecific, though he does not mention *A. orcuttiana* in the text at all, even though the type is from Baja California Norte. Table 1 presents the salient differences between the two taxa. Although

the morphological distinctions are incomplete and difficult to interpret, they are separated geographically (Fig. 5). *Aristida orcuttiana* is here relegated to varietal status under *A. schiedeana:*

**Aristida schiedeana** Trinius & Ruprecht var. **orcuttiana** (Vasey) Allred & Valdés-Reyna, comb. nov. Basionym: *Aristida orcuttiana* Vasey, Bull. Torrey Bot. Club 13: 27. 1886. SYNTYPES: Mexico. Baja California Norte: Hansen's Ranch, 6000 ft., 30 July 1883, *C. R. Orcutt 507* (lectotype, selected here, US). U.S.A. Arizona: *M. E. Jones* (not seen).

KEY TO THE MEMBERS OF THE *ARISTIDA SCHIEDEANA* COMPLEX:

1a. Panicles open, all the primary branches with axillary pulvini and spreading sharply outward from the main axis upon exsertion of the panicle from the sheath and throughout maturity.
  2a. Lemmas with three well-developed awns, the lateral awns at least ¼ the length of the central awn . . . . . *A. laxa* Cavanilles (We use the name *A. laxa* Cavanilles in its traditional sense, although Sánchez-Ken (pers. comm.) informs us that in the type of *A. laxa*, the lateral awns are nearly absent; there may be difficulties with the application of this name.)
  2b. Lemmas with a single well-developed awn, the lateral awns minute or at most ¼ the length of the central awn . . . . . *A. schiedeana* Trinius & Ruprecht
    3a. First glume usually equal to or shorter than the second; glumes usually scabrous; blade above ligule usually with scattered pilose hairs; collar usually with a line of short hairs . . var. *schiedeana*
    3b. First glume usually longer than the second; glumes usually glabrous; blade above ligule usually glabrous; collar usually lacking a line of hairs . . . . . var. *orcuttiana* (Vasey) Allred & Valdés-Reyna
1b. Panicles closed, contracted, none of the primary branches (or occasionally only the lowermost) with axillary pulvini and thus not spreading from the axis, though the branch tips or spikelets may droop outward.
  4a. Lemmas (16–)18–22(–25) mm long (from the base of the callus to the divergence of the awn); panicles few flowered, with 3–12 loosely disposed spikelets . . . . . *A. spanospicula* Allred & Valdés-Reyna
  4b. Lemmas less than 10–13 mm long (from the base of the callus to the divergence of the awn); panicles densely flowered, with 16 or more congested spikelets . . . . . *A. eludens* Allred & Valdés-Reyna

Table 1. Comparison of *Aristida schiedeana* Trinius & Ruprecht and *A. orcuttiana* Vasey.

| | *A. schiedeana* | *A. orcuttiana* |
|---|---|---|
| Pilose hairs above ligule | Usually present | Usually absent |
| Collar hairs | Usually present in a line | Usually absent |
| Glume pubescence | Usually scabrous | Usually glabrous |
| Glume 1 length (mm) | 6–15 usually equal to glume 2 | 6–14 usually longer than glume 2 |
| Glume 2 length (mm) | 8–14 | 5–10(–13) |
| Central awn length (mm) | (5–)7–15 | 5–14 |
| Lateral awn length (mm) | 0.3–1.5(–4) | 0–3(–7) |
| Distribution (Fig. 5) | North-central Mexico to Nicaragua | Southwestern United States to northern Mexico |

*ARISTIDA PURPUREA* NUTTALL COMPLEX

The *Aristida purpurea* complex has tightly involute to loosely folded blades, panicles without axillary pulvini (except in two varieties), and strongly unequal glumes, the first much shorter than the second. Its members are common in arid and semiarid plains and deserts, and include *A. purpurea* s.l. (Allred, 1984), *A. brownii* Warnock, and *A. curvifolia* Fournier.

**Aristida purpurea** Nuttall var. **perplexa** Allred & Valdés-Reyna, var. nov. TYPE: U.S.A. New Mexico: Doña Ana County, USDA Jornada Experimental Range, ca. 16 mi. NE of Las Cruces, pasture 12, ca. 4800 ft., sandy soil, very common, 15 July 1986, *K. W. Allred 4035* (holotype, NMCR). Figure 6.

Varietas nova *Aristidae pansae* et *A. purpureae* similis; ab *A. pansa* arachnoideis destitutis angulis vaginarum, glumis inaequalibus (primis secundis brevioribus), et aristis longis ascendentibus differt; ab *A. purpurea* paniculis apertis habentibus pulvinos axillares differt.

*Plants* perennial, tufted; *culms* (30–)40–65 cm tall, erect, simple or sparsely branched at the base; *internodes* terete, glabrous to puberulent. *Leaves* basal and cauline, yellowish to pale green. *Sheaths* rounded on the back, glabrous to puberulent, with longer hairs at the summit; *collars* usually with a line of short stiff hairs across the back, the corners glabrous or with a tuft of erect, straight to somewhat crinkly hairs (but not cobwebby) ca. 1 mm long; *throats* puberulent in addition to the ligule. *Ligules* a fringe of hairs ca. 0.5 mm long. *Blades* rolled when fresh, sometimes only loosely folded, usually glabrous abaxially and puberulent adaxially, mostly

Figure 5. Geographic distributions of *Aristida schiedeana* Trinius & Ruprecht var. *schiedeana* (open circles) and variety *orcuttiana* (Vasey) Allred & Valdés-Reyna (closed circles).

8–20 cm long and less than 1 mm wide, arcuate to curling upon drying. *Panicles* (8–)10–26 cm long and (4–)6–12 cm wide, open, pyramidal; *primary branches* stiffly ascending to widely spreading from axillary pulvini, sometimes somewhat flexuous or capillary, naked at the base, the lower ones 3–6 (–8) cm long; *pulvini* present in the axils of the primary branches but usually absent from the pedicels, the spikelets thus appressed along the branches. *Glumes* glabrous, membranous to scarious, light tan, strongly unequal and the first ½ to ¾ the length of the second, 1-nerved, the first (4.5–) 5–7(–7.5) mm long, the second 8–11(–12) mm long. *Lemmas* glabrous to scabrous, often mottled, (8–) 10–12(–13) mm long from the base of the callus to the divergence of the awns; *beak* usually not twisted, reaching about to the tip of the second glume or slightly beyond, 2.5–3.5(–4) mm long and 0.1–0.2 mm wide; *awns* subequal, mostly spreading 40–50°, rarely approaching 90° from the vertical, the central awn (1.5–)2–3 cm long, the lateral awns 2–4 mm shorter; *callus* 0.5–1 mm long with short stiff hairs ca. 0.5 mm long. *Paleas* completely enclosed by the lemmas, membranous, acute, 2-nerved, 1–1.3 mm long. *Stamens* 3, the anthers 0.7–1.5 mm long. *Lodicules* 2, flabellate, 1–1.4 mm long. *Caryopses* fusiform, light brownish.

*Flowering* July–October. *Distribution.* Sandy to rocky plains and mesas in desert grassland/scrub communities, often calcareous soil; Mexico, in the states of Chihuahua, Coahuila, and San Luis Potosí; United States, in the states of Arizona, New Mexico, and Texas (Fig. 7).

The epithet *perplexa* refers to the prior confusion of this variety with *Aristida pansa*.

Because of its spreading panicle branches, specimens of variety *perplexa* have long been confused with *Aristida pansa* Wooton & Standley. The new variety differs from this latter species by its lack of cobwebby hairs at the collar (a feature consistent throughout the *A. pansa* complex), by the acuminate unequal glumes (the first ½–¾ the length of the second), and by the longer awns (mostly 2–3 cm vs. 1.5 cm or less), which generally ascend at an angle of 40–50° rather than being nearly horizontal.

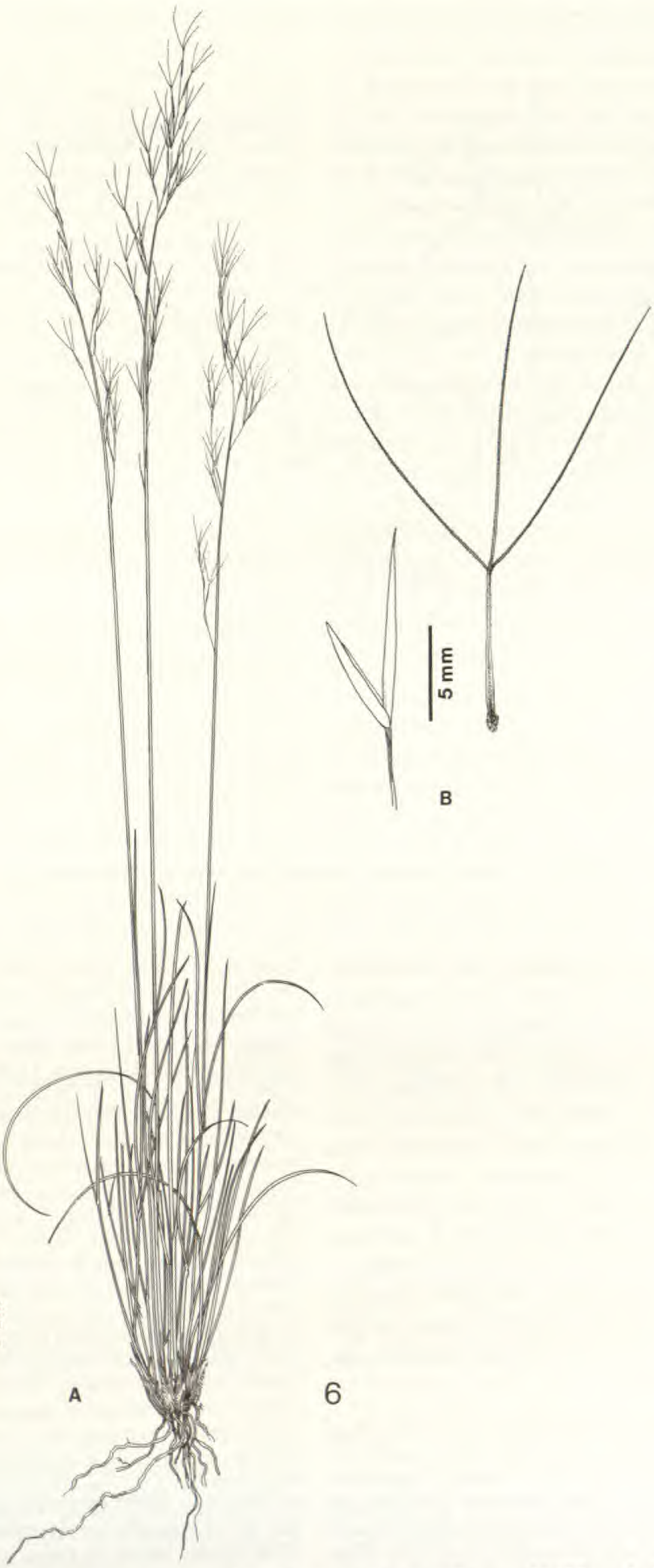


Figure 6. *Aristida purpurea* Nuttall var. *perplexa* Allred & Valdés-Reyna (*Peterson 10632*). —A. Habit. —B. Spikelet: glumes left, floret right.

Figure 7. Geographic distribution of *Aristida purpurea* Nuttall var. *perplexa* Allred & Valdés-Reyna.

The spikelets of variety *perplexa* are essentially identical to spikelets of *A. purpurea* var. *purpurea.* Variety *perplexa* may grow in homogeneous isolated populations (the type locality) or be sympatric with *A. pansa* and other varieties of *A. purpurea,* as is the case at the type locality of *A. pansa* in Doña Ana County, New Mexico. Variety *perplexa* is the second variety in the *A. purpurea* complex with spreading, pulvinate panicle branches. The other, variety *parishii* (A. S. Hitchcock) Allred, which is restricted to Sonoran Desert habitats, is similar to variety *wrightii* (Nash) Allred and often lacks the axillary pulvini so that the panicle is narrow or spicate. The panicles of variety *perplexa,* however, are consistently pulvinate.

*Paratypes.* MEXICO. **Chihuahua:** just S of New Mexico border near Columbus, rocky hills, 15 Oct. 1983, *K. W. Allred 2629* (NMCR); Sierra Las Pampas, N end of the sierra along dirt road from Las Pampas to jct. with road to Camargo, 6.2 mi. SE of jct., Chihuahuan Desert Scrub, rocky calcareous slope, 4500 ft. (1372 m), 23 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5806, 5807* (NMCR); near Chihuahua, 13 Oct. 1885, *C. G. Pringle s.n.* (POM/RSA). **Coahuila:** 16.9 km NE of San Miguel on road towards Boquillas, 1180 m, 13 Sep. 1991, *P. M. Peterson 10608* (ANSM, NMCR, US); Sierra El Pino, 9.2 km SW of Rancho El Cimarron along the eastern slope, calcareous rocky slopes, 1500 m, 14 Sep. 1991, *P. M. Peterson 10632* (ANSM, NMCR, US); near La Rosa, 5000 ft., 18 Aug. 1940, *F. Shreve & E. R. Tinkham 4593* (ARIZ). **San Luis Potosí:** along hwy. 49 from Zacatecas to San Luis Potosí, 32.4 mi. E of Salina, 21 mi. W of San Luis Potosí, desert thorn scrub community, rocky soil, 6200 ft. (1890 m), 26 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5873, 5874, 5875* (NMCR); along hwy. 57 at jct. to San Jose del Refugio, gypsum, 1340 m, 20 Oct. 1978, *J. R. Reeder 7052* (ARIZ). U.S.A. **Arizona:** Cochise Co., along Cascabel to Willcox road, near 8 mi. marker, rocky limestone slope with ocotillo, Agave and grasses, 1450 m, 25 Aug. 1992, *J. R. & C. G. Reeder 8878* (ARIZ, NMCR); 1 mi. NW of Naco (Waco?), 6 Oct. 1936, *L. N. Goodding 389* (ARIZ); Apache Pass between Dos Cabezas and Chiricahua Mts., Siphon Cnyn., 1450 m, 23 Aug. 1993, *J. R. Reeder 9020* (ARIZ). Pima Co., Santa Rita Mts., hwy. jct. E of Vail, 3000 ft., 7 Sep. 1938, *L. Benson 9121* (ARIZ). **New Mexico:** Bernalillo Co., 3 mi. W of Albuquerque, 9 Oct. 1945, *R. A. Darrow 3367* (ARIZ). Chaves Co., Hwy. 380 ca. 15 mi. W of Caprock, 8 July 1982, *K. W. Allred 2314* (NMCR); 3.5 mi. E of Elkins on hwy. 70, sandy, oak-*Artemisia*-grassland, 26 Aug. 1974, *L. C. Higgins 9172* (NMC). Doña Ana Co., Ropes Spring, San Andres Mts., 17 Aug. 1933, [collector unknown] *89* (NMCR); 7 mi. W

of Hatch at jct. of hwy. 26 and 85, 2 Oct. 1982, *T. Potter 17* (NMCR); Las Cruces, 6 Oct. 1904, *D. Griffiths 7417* (NMCR); near Tortugas Mt., 24 Oct. 1904, *E. O. Wooton s.n.* (NMC); White Sands Missile Range, 5 km E of headquarters, 200 m S of Nike Ave., granitic sandy bajada, 23 Sep. 1990, *R. Spellenberg 10678* (NMC). Eddy Co., abt. 40 mi. E of Roswell, 7 mi. N of hwy. 380, Mather Natural Area, sandy, shin oak, 3 Aug. 1979, *R. Spellenberg 5249* (NMC). Guadalupe Co., 2 mi. S of Vaughn, 15 July 1979, *L. Rockhill 20* (NMCR). Luna Co., Cooke's Range, Provinger Draw, 12 Aug. 1986, *J. T. Columbus 419* (NMCR); 5 mi. W of Columbus, 9 July 1984, *J. S. Trent 107* (NMCR). Socorro Co., ca. 12 mi. E of San Antonio along hwy. 380, 5 July 1984, *K. W. Allred 2700* (NMCR); roadside E of Belen on hwy. 60, 7 Apr. 1952, *E. F. Castetter 7962* (NMC). Valencia Co., 20 mi. NE of Suwanee, 1 Sep. 1935, *K. W. Parker 633* (NMCR). **Texas:** Culberson Co., deep sand 21 mi. W of Kent, 4000 ft., 17 Aug. 1950, *B. H. Warnock 9317* (SR); dunes near Salt Flats, 4000 ft., 29 Aug. 1965, *B. H. Warnock 20678* (SR); at Salt Flat Station, E of Salt Flat, 4000 ft., 29 Aug. 1965, *B. H. Warnock 20674* (SR). Pecos Co., limestone hills 20–35 mi. S of Ft. Stockton, along Sanderson hwy., 3100 ft., 1 July 1955, *B. H. Warnock 13266* (SR).

*Aristida brownii* Warnock (Warnock, 1982) was described to accommodate single-awned *Aristida* (the lateral awns highly reduced) otherwise identical to *A. purpurea* var. *wrightii*. Since its description from Brewster County, Texas, individuals of this entity have been found from other Texas localities, several locations in southern New Mexico, and one locality in Coahuila, Mexico. Plants of *A. brownii* are always found intermingled with variety *wrightii*, usually in sparse numbers, and never as isolated homogeneous populations. In addition, it is not uncommon to find in the same population with typical *A. brownii* plants with lateral awns ¼–¾ the length of the central awn, an attribute intermediate between *A. brownii* and the sympatric variety *wrightii*. We find the recognition of this taxon untenable at the species level. Because the single-awned feature is unique in *A. purpurea* s.l. and easily confused with other taxa, we propose its recognition at the level of forma. We have placed the name in a 3-level hierarchy to indicate its affinities within *A. purpurea*, i.e., *A. purpurea* var. *wrightii* forma *brownii*.

**Aristida purpurea** Nuttall forma **brownii** (Warnock) Allred & Valdés-Reyna, comb. nov. Basionym: *Aristida brownii* Warnock, Sida 9: 358. 1982. TYPE: U.S.A. Texas: Brewster County, widespread perennial on limestone hills of Del Norte Mountains, elevation 4600 ft. or more, 27 June 1981, *Warnock 141* (holotype, Lajitas Museum, not seen; isotypes, SMU, TEX).

Allred (1984) reduced *Aristida curvifolia* Fournier to a variety of *A. purpurea* because its strongly unequal glumes are also characteristic of the other varieties of *A. purpurea*. Further field studies during the subsequent 10 years have shown that disposition to be unwarranted, and we propose the reinstatement of this taxon at the species rank, as did Dávila & Sánchez-Ken (1994). *Aristida curvifolia* is consistently distinguished from all other desert *Aristida* by the following features: blades stiff, tightly involute, yellow-green, the epidermis nearly smooth and the veins hardly noticeable; glumes broad, blunt, unequal; lemma beak (apex) 1–2 mm long, 0.2–0.5 mm wide, straight to only slightly twisted even when mature; panicles spicate, always epulvinate. *Aristida curvifolia* often grows with both *A. purpurea* and *A. pansa*, and no evidence of hybridization or intermediacy has been noted. Indeed, this taxon turns out to be one of the more uniform species of *Aristida* in North America. It is presently known from 12 states in Mexico: Aguascalientes, Baja California Norte, Chihuahua, Coahuila, Guanajuato, Nuevo León, Oaxaca, Puebla, San Luis Potosí, Tamaulipas, Veracruz, and Zacatecas.

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Literature Cited

Allred, K. W. 1984. Morphologic variation and classification of the North American *Aristida purpurea* complex (Gramineae). Brittonia 36: 382–395.

Beetle, A. A. 1983. Las Gramíneas de México. Secretaria de Agricultura y Recursos Hidráulicos, México City.

Dávila, P. & J. Sánchez-Ken. 1994. Flora del Valle de Tehuacán-Cuicatlán. Fasc. 3: 7–22. Inst. Biol. Univ. Nac. Aut. México, México D.F.

Gould, F. W. & R. Moran. 1981. The Grasses of Baja California, México. San Diego Society of Natural History, Memoir 12.

Henrard, J. T. 1927. A critical revision of the genus *Aristida*. Meded. Rijks-Herb. 54: 221–464.

———. 1928. A critical revision of the genus *Aristida*. Meded. Rijks-Herb. 54: 465–701.

———. 1929. A monograph of the genus *Aristida*. Meded. Rijks-Herb. 58: 1–153.

Hitchcock, A. S. 1924. The North American species of *Aristida*. Contr. U.S. Natl. Herb. 22: 517–586.

———. 1935. *Aristida*. North American Flora 17: 376–406.

McVaugh, R. 1983. Flora Novo-Galiciana, Vol. 14, Gramineae. Univ. Michigan Press, Ann Arbor.

Pohl, R. W. & G. Davidse. 1994. *Aristida*. Pp. 253–257 *in:* G. Davidse, M. Sousa S. & A. O. Chater (editors), Flora Mesoamericana, Vol. 6. Alismataceae a Cyperaceae. Universidad Nacional Autónoma de México, México D.F.; Missouri Botanical Garden, St. Louis; The Natural History Museum, London.

Warnock, B. H. 1982. A new three-awn grass from trans-Pecos Texas. Sida 9: 358–359.

# Two New Species of the Genus *Sterigmapetalum* (Rhizophoraceae) from the Venezuelan and Brazilian Amazonian Region

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ABSTRACT. Two new species of *Sterigmapetalum* subg. *Sterigmapetalum* are described from Venezuela and Brazil: *S. chrysophyllum* and *S. plumbeum*. Relationships with related species are discussed, and an illustration for each species is provided.

RESUMEN. Se describen dos nuevas especies de *Sterigmapetalum* subgénero *Sterigmapetalum* de Venezuela y Brasil: *S. chrysophyllum* y *S. plumbeum*. Se discuten sus relaciones con las especies afines y se presentan ilustraciones de cada una de ellas.

*Sterigmapetalum* Kuhlmann is a small neotropical genus with nine species in the Rhizophoraceae. *Sterigmapetalum* and *Cassipourea* Aublet were segregated by Steyermark & Liesner (1983) into a new tribe, the Hypogyneae. Subsequently, Tobe & Raven (1987), based on a detailed study of the morphology of the seed, flower, and fruit, placed these two genera in the Macarisieae, a treatment originally employed by Schimper (1893) a century earlier.

Eight of the nine species of *Sterigmapetalum* occur in northern South America (Colombia, Venezuela, Guyana, and Surinam) and one (*S. obovatum* Kuhlmann) is restricted to the western and central Amazonian region of Peru and Brazil (Prance et al., 1975).

**Sterigmapetalum chrysophyllum** Aymard & Cuello, sp. nov. TYPE: Venezuela. Amazonas: Dpto. Atabapo, Río Ventuari, bosques en plateau, 04°14′N, 65°58′W, 1250 m, Feb. 1992 (fl), Proyecto Inventario de los Recursos Naturales de la Guayana Venezolana-CVG-TECMIN, *A. Chaviel 411* (holotype, PORT; isotypes, MO, VEN). Figure 1.

Species nova quae a *S. exappendiculato* Steyermark & Liesner stipulis triangularibus, acutis, 3–5 mm longis; foliis coriaceis, 3–8 cm longis, supra glabris, pagina inferna tomento flavo omnino occulta; petiolo 2–4 mm longo, juventute dense flavo-tomentoso; petalis extus epapillatis, fimbriis lateralibus munitis differt.

Trees 15–20 m high; branches 3-verticillate, terete, covered completely by a yellow-ocher pubescence when young, glabrous or sparsely adpressed-pubescent when mature. Stipules triangular, acuminate, 3–5 mm long, with yellow pubescent trichomes on both surfaces, internally glandular at the base. Leaves 3-whorled, the blades coriaceous, elliptical or oblong-elliptical, 3–8 × 1.5–5.5 cm, obtuse to truncated at the base, retuse at apex, margin subrevolute, crenate, blades glabrous on upper surface, covered completely by yellow tomentum on under surface, lateral nerves 8–14 pairs, tertiary venation more evident on upper surface than on under surface; petiole 2–4 × 1–2 mm, densely yellow-ocher pubescent when young, glabrous or sparsely adpressed-pubescent when mature. Inflorescences solitary in the leaf axils, 1–2 cm long; 1 to many flowers, peduncle striate, adpressed-pubescent with yellow trichomes; pedicels 1 mm long, adpressed-pubescent with yellow trichomes on both surfaces; flowers subtended by bractlets, lanceolate, 1–2 mm long, adpressed-pubescent with yellow trichomes on both sides; staminate flowers with 5-lobulate calyx, obovate, 3–5 × 2–3 mm (calyx and lobes), adpressed-pubescent with yellow trichomes externally, adpressed-pubescent with sericeous trichomes internally; petals 5, 2–3 mm long, unguiculate, externally adpressed-pubescent with yellow trichomes from the middle to the apex, glabrous internally, with three apical appendices and two lateral ligules, the ligules 1–1.5 mm long, glabrous, 4–5-laciniate; stamens 8–10, united at the base, filaments glabrous, 1–2 mm long, anthers 1 mm long, oblong, glabrous; pistilodium rudimentary, conic, hispid with yellow trichomes; pistillate flowers not seen. Fruit obovate, 8–12 × 4–7 mm, completely covered by an adpressed yellow-ocher indument, seeds 4–5 mm long, oblong, glabrous and reticulate.

*Distribution and common names. Sterigmapetalum chrysophyllum* is only known from the middle and upper Ventuari River basin, Atabapo Department, Amazonas State, Venezuela, at 1250 m. It is

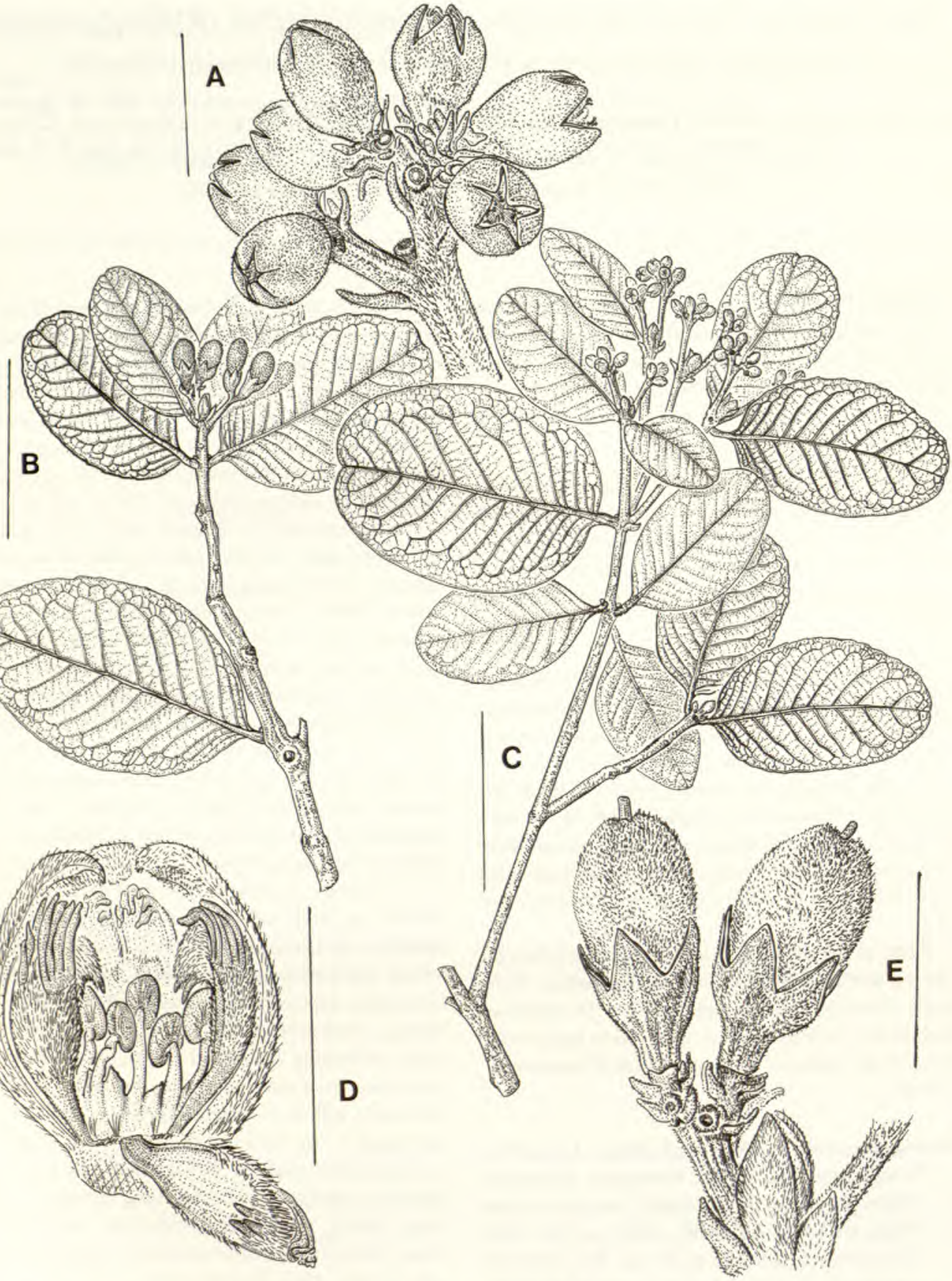


Figure 1. *Sterigmapetalum chrysophyllum* Aymard & Cuello. —A. Inflorescence with open flowers. —B. Fruiting branch. —C. Flowering branch. —D. Flower with 1 sepal removed leaving a horizontal scar. —E. Young fruit. Scale: A, D = 0.5 cm; B, C = 5 cm; E = 1 cm. A, C, and D drawn from holotype (*Chaviel 411*); B and E drawn from paratype (*Chaviel 406*).

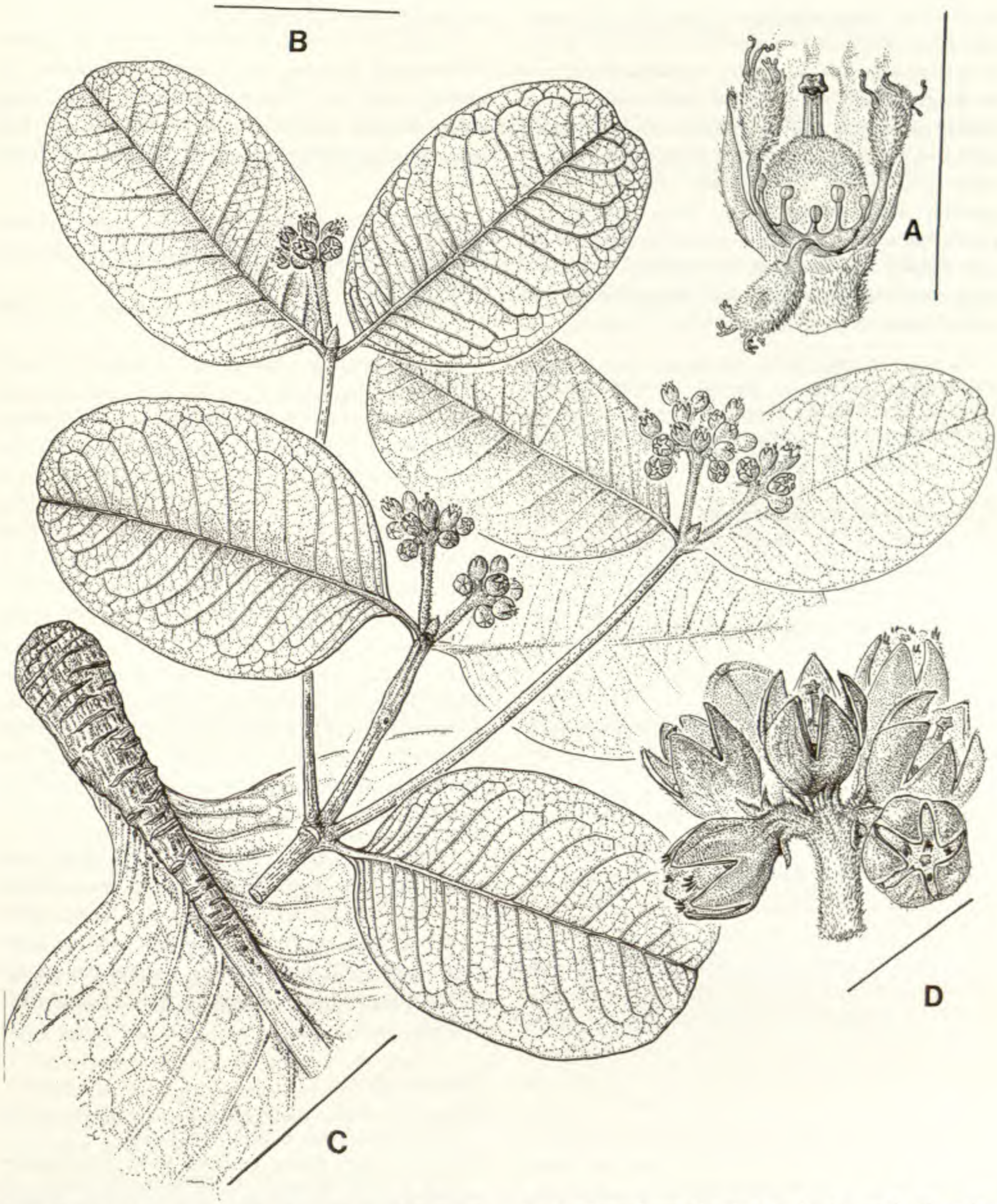


Figure 2. *Sterigmapetalum plumbeum* Aymard & Cuello. —A. Pistillate flower showing the ligules. —B. Flowering branch. —C. Base of the under surface of the leaf lamina. —D. Pistillate inflorescence. Scale: A, C, and D = 1 cm; B = 5 cm. All from *Daly et al. 5608*.

known by the common names of "kasemani" and "tadiji" (Y'ekuana).

*Ecology.* Mesothermic humid forests of medium height (18–25 m), on sandstone surface outcroppings.

The absence of resinous exudate and the presence of 3-whorled leaves and laciniate petal ligules indicate that *Sterigmapetalum chrysophyllum* belongs to subgenus *Sterigmapetalum* (Steyermark & Liesner, 1983). This new species is related to *S. exappendiculatum* Steyermark & Liesner, but it differs in its triangular-acuminate stipules that are 3–5 mm long (vs. stipules ovate-lanceolate, subobtuse, and 7–10 mm long); coriaceous leaves that

are 3–8 cm long, glabrous or sparsely adpressed-pubescent above and completely covered by yellow indumentum below (vs. leaves subcoriaceous, 7–14 cm long, sparsely pilose on the midrib above, moderately to densely adpressed-sericeous below); petioles 2–4 mm long, completely covered by a yellow-ocher pubescence when young, and glabrous or sparsely adpressed-pubescent when mature; and petals that are not papillate externally, with two lateral ligules 4–5-laciniate (vs. petiole 5–11 mm long, sericeous-tomentose, and petals that are papillate externally and without lateral ligules).

*Paratype.* VENEZUELA. **Amazonas:** Dpto. Atabapo, Río Ventuari, bosques en plateau, 04°14′N, 65°58′W, 1250 m, Feb. 1992 (fl), Proyecto Inventario de los Recursos Naturales de la Guayana Venezolana-CVG-TECMIN, *A. Chaviel 406* (MO, PORT, VEN).

**Sterigmapetalum plumbeum** Aymard & Cuello, sp. nov. TYPE: Brazil. Amazonas: Mun. São Gabriel da Cachoeira, Upper Rio Negro, near Comunidade Aparecida, opposite mouth of Igarapé Tuari, 0°20′N, 67°19′W, 6 Nov. 1987 (fl), *D. C. Daly, P. J. Maas & J. Ramos 5608* (holotype, MO; isotypes, INPA, NY). Figure 2.

A *S. colombiano* Monachino stipulis triangularibus, 5–6 mm longis; foliis coriaceis, oblongis, 8–11 cm longis, 5–7.5 cm latis, utrinque glabris, nervis lateralibus 17–24-jugatis; inflorescentiis 1.4–2.2 cm longis; floribus 4–5 mm longis, sepalis intus indumento grisaceo nitido obtectis, petalis oblanceolatis differt.

Trees 8 m high; branches 3-verticillate, lenticellate, sparsely adpressed-pubescent when young, glabrous when mature. Stipules triangular, 5–6 mm long, densely adpressed-pubescent on both surfaces, barbate and glandular internally at the base. Leaves 3-whorled, the blades coriaceous, oblong, 8–11 × 5–7.5 cm, base rounded, apex emarginate, margins subrevolute, glabrous on both surfaces, lateral nerves 17–24 on both sides, tertiary venation very evident on both surfaces, petioles 5–7 × 2–3 mm, sparsely adpressed-pubescent on young leaves, glabrous on mature leaves. Inflorescences solitary in the axils, 1.4–2.2 cm long; peduncles adpressed-pubescent, especially at the base; pedicels 1–2 mm long, adpressed-pubescent, subtended by 3 bracts, lanceolate-triangular, the bracts 3 mm long, sparsely adpressed-pubescent externally, densely adpressed-pubescent internally; pistillate flowers with a 5-lobulate calyx, 4–5 mm long, 3–4 mm wide, glabrous to sparsely pilose externally, densely adpressed-pubescent internally with a silvery gray indumentum; petals 5, white, 5–5.5 mm long, unguiculate, oblanceolate, externally adpressed-pubescent from the middle to the apex, internally glabrous, with five lateral ligules, the ligules 3 mm long, glabrous, 5-laciniate; staminodes 10, united at the base, filaments glabrous, 1 mm long; ovary densely pubescent, style glabrous, 3 mm long, stigma capitate, staminate flowers and fruits not seen.

*Distribution.* Only known in the upper Rio Negro region, Municipio San Gabriel de Cachoeira, Amazonas, Brazil.

*Ecology.* Upper Amazonian caatinga, on sandy soil.

*Sterigmapetalum plumbeum* is related to *S. colombianum* Monachino (restricted to mesothermic humid forests in the department of Magdalena, northwestern Colombia; Barbosa, 1988), but it can be distinguished from this species by the triangular stipules, 5–6 mm long, coriaceous leaves, oblong, 8–11 cm long, 5–7.5 cm wide, glabrous on both sides, lateral nerves 17–24 (vs. ovate stipules, 1.5–2 mm long, subcoriaceous, obovate leaves, 4.5–6.7 cm long, 2–4 cm wide, glabrous to sparsely pilose on the main vein and lateral ones below, lateral nerves 8–12); inflorescences 1.4–2.2 cm long, pistillate flowers 4–5 mm long, with sepals internally covered by a silvery gray indumentum and petals oblanceolate (vs. inflorescences 8–10 mm long, pistillate flowers 2–3 mm long with sepals internally sericeous and the petals subobovate).

*Acknowledgments.* We thank Paul Berry and Bruce Holst for their collaboration during our stay at the Missouri Botanical Garden, Roy Gereau (MO) for the verification of the Latin descriptions, Laurence Dorr (US) for valuable comments on the manuscript, and John Myers for the excellent illustrations.

Literature Cited

Barbosa, C. 1988. Rhizophoraceae en el Herbario Nacional Colombiano. Trianea 2: 251–263.

Prance, G. T., M. Freitas da Silva, B. W. Alburquerque, I. de J. da Silva Araujo, L. M. Medeiros Carreira, M. M. Nogueira Braga, M. Macedo, P. N. Da Conceicão, P. L. Braga Lisboa, P. I. Braga, R. C. Lobato Lisboa & R. C. Queiroz Vilhena. 1975. Revisão Taxonómica das especies amazónicas de Rhizophoraceae. Acta Amazonica 5: 5–22.

Schimper, A. F. W. 1893. Rhizophoraceae. *In:* A. Engler & K. Prantl (editors), Die Natürlichen Pflanzenfamilien. Wilhelm Engelmann, Leipzig. 3(7): 42–56.

Steyermark, J. A. & R. Liesner. 1983. Revision of the genus *Sterigmapetalum* (Rhizophoraceae). Ann. Missouri Bot. Gard. 70: 179–193.

Tobe, H. & P. H. Raven. 1987. The embryology and relationships of *Cassipourea* and *Sterigmapetalum* (Rhizophoraceae–Macarisieae). Opera Bot. 92: 253–264.

# Taxonomic Changes in Ixonanthaceae from the Venezuelan Guayana

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ABSTRACT. *Cyrillopsis micrantha* (Steyermark) P. E. Berry & N. Ramírez is a new combination based on *Ochthocosmus micranthus* Steyermark and constitutes only the second known species of *Cyrillopsis* (Ixonanthaceae). The number of varieties in *Ochthocosmus roraimae* Bentham is reduced from three to two, and *Ochthocosmus parvifolius* Hallier f. is treated as a species of uncertain status, with no known extant type material.

The family Ixonanthaceae, which is sometimes treated as a subfamily of the Linaceae, includes two genera in the Neotropics, *Cyrillopsis* and *Ochthocosmus*. These two genera are distinguished mainly by fruit and pedicel characters. *Ochthocosmus* has a 5-locular ovary, the fruit is a prismatically cylindric, elongate, 5-valved capsule, and the seeds have a conspicuous, thin, lateral wing. Furthermore, the pedicels are non-articulated, that is, they abscise flush with the rachis. In contrast, *Cyrillopsis* has a 2-locular ovary, its fruit is an elongate, slightly asymmetrical, 2-valved capsule, and the seeds lack wings but are partly covered at the upper end by a 2-lobed membranaceous aril; its pedicels are articulated, with an abscission zone and bracteoles located roughly one-third of the way up the pedicel from the rachis.

Until now, *Cyrillopsis* was considered to have a single species, *C. paraensis* Kuhlman, and *Ochthocosmus* to have eight recognized neotropical species (Steyermark & Luteyn, 1980; Steyermark, 1984, 1988). Although some botanists, such as Mabberley (1990), consider *Ochthocosmus* to include species both in South America and in Africa, Forman (1965) presented convincing arguments to place the African species in the genus *Phyllocosmus* Klotzsch, thus leaving *Ochthocosmus* as a strictly neotropical group.

While preparing the treatment of the Ixonanthaceae for the *Flora of the Venezuelan Guayana*, we examined recently collected fruiting material of *Ochthocosmus micranthus* Steyermark, a species that was described from flowering specimens only (Steyermark, 1988). The articulated pedicels, arillate seeds, and 2-locular fruits of these new collections place the species clearly in *Cyrillopsis* rather than in *Ochthocosmus*. The transfer of *O. micranthus* to *Cyrillopsis* brings the number of currently recognized species in *Cyrillopsis* to two and in *Ochthocosmus* to seven. We also reduce the number of varieties in *O. roraimae* from three to two by removing *O. roraimae* Bentham var. *parvifolius* (Hallier f.) Steyermark & Luteyn as a variety of this species.

**Cyrillopsis micrantha** (Steyermark) P. E. Berry & N. Ramírez, comb. nov. Basionym: *Ochthocosmus micranthus* Steyermark, Ann. Missouri Bot. Gard. 75: 318. 1988. TYPE: Venezuela. Bolívar: Ayavaparú, 10 km SW of Wadacapiapué, 5°18′N, 60°58′W, 1100 m, 13 Nov. 1986, *Hernández 348* (holotype, VEN; isotype, NY). [Steyermark (1988) was incorrect in citing the holotype at MO; rather, the holotype is at VEN and is so labeled, and there is no type material at MO.] Figure 1.

Steyermark described this species based on two flowering specimens that strongly resemble other species of *Ochthocosmus* from the Guayana region. Three more recent collections from the type locality, however, *Huber 11958*, *Huber & Hernández 11948*, and *Hernández 395*, all have nearly mature fruits, and they conform to the characteristics of *Cyrillopsis* described above (see Fig. 1). Also, the type collection and the other specimens cited below all have the characteristic articulated pedicels of *Cyrillopsis* that do not occur in *Ochthocosmus*.

This second species of *Cyrillopsis* has much smaller leaves than the previously known species, *C. paraensis* Kuhlman. Whereas *C. paraensis* is pri-

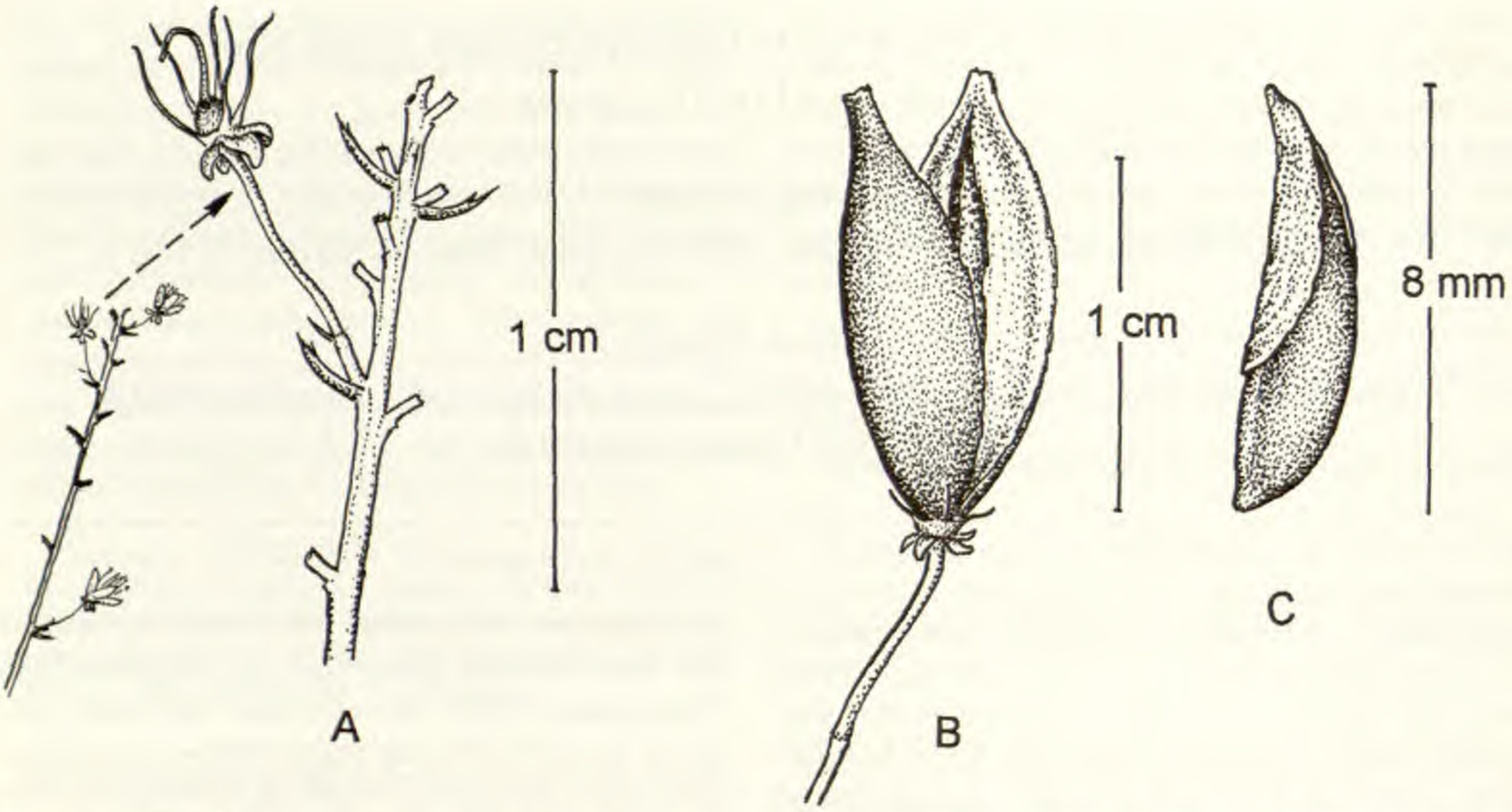


Figure 1. Details of an inflorescence and fruit of *Cyrillopsis micrantha* (Steyermark) P. E. Berry & N. Ramírez. —A. Section of inflorescence after most of the flowers have dehisced. Note the articulated pedicels and the bracteole at the point of articulation. Drawn from *Hernández 348* (VEN). —B. Mature fruit, a somewhat fleshy capsule splitting into two halves. —C. Seed with arillate structure at the apex. B and C drawn from *Huber & Hernández 11948* (MO).

marily a lowland species distributed from southeastern Venezuela to French Guiana and northern Brazil, *C. micrantha* is an upland species endemic to the southeastern part of the Gran Sabana at around 1100 m elevation. It occurs in an unusual shrub savanna (described in Fölster, 1992: 37) that is dominated by a sympatric population of *Ochthocosmus roraimae.*

*Additional specimens examined.* VENEZUELA. **Bolívar:** Ayavaparú, 10 km SW of Wadakapiapué, 5°18′N, 60°58′W, 1100 m, 13 Nov. 1986, *Hernández 359* (US, VEN); Ayavaparú, 15 km al W de Wadakapiapué-tepui, 5°16′30″N, 61°00′W, 1110 m, 6 Mar. 1987, *Hernández 395* (herbarium at San Ignacio de Yuruaní, Venezuela); ca. 10 km SW of Wadakapiapué-tepui, N of the junction of the Río Caraurín and the Río Yuruaní, ca. 1100 m, 5°15′N, 60°58′W, 18 Feb. 1987, *Huber & Hernández 11948* (MO, US, VEN); ca. 10 km SW of Wadakapiapué-tepui, N of the junction of the Río Caraurín and the Río Yuruaní, ca. 1030 m, 5°14′N, 60°58′W, 19 Feb. 1987, *Huber 11958* (MO, MYF, US—2 sheets, VEN).

The label of *Hernández 395* cites "Wontai" as a common name for this species (in Taurepán, a dialect of the Pemón Amerindian group).

*Ochthocosmus roraimae* Bentham in Hooker, London J. Bot. 2: 366. 1843. TYPE: Guyana or Venezuela ("British Guiana" on label), large shrub 12–16 ft. high, banks of rivers, near Mt. Roraima, Oct.–Nov. 1842, *Richard Schomburgk 1037* (holotype, K, photo, MO).

This species is widespread over much of the Venezuelan Gran Sabana and extends into western Guyana and adjacent Roraima state in Brazil. It occurs between 800 and 1300 m elevation; field observations by Gabriel Picón and Nelson Ramírez (pers. comm.) have shown *O. roraimae* to be a variable taxon occurring in a variety of local habitats, from fairly open shrublands to low or moderately tall and dense forest.

Steyermark & Luteyn (1980) recognized three varieties under *O. roraimae:* var. *roraimae,* var. *parvifolius* (Hallier f.) Steyermark & Luteyn, and var. *grandifolius* (Steyermark) Steyermark & Luteyn. *Ochthocosmus roraimae* var. *grandifolius,* which is known only from the type collection, is unique in its large, stiff, and virtually entire-margined leaves, so it is maintained here as a distinct variety. However, Steyermark and Luteyn employed an extremely narrow concept for the typical variety *roraimae,* characterizing it by a shiny and reticulately raised-veined upper surface and assigning to it only two additional specimens besides the type (of which they examined a reduced black-and-white photograph). They then relegated to variety *parvifolius* all remaining specimens of the species, encompassing a wide range of variation in leaf size, crenulation of the margins, and length of the inflorescence. After examining a full-sized color Cibachrome print of the type of *O. roraimae,* kindly sent by the Kew herbarium,

and studying the full range of variation of the species, there is no consistent way to distinguish the specimens of variety *roraimae* from variety *parvifolius*, and all specimens cited by Steyermark & Luteyn (1980) under variety *parvifolius* are now treated as belonging to variety *roraimae*. The status of the basionym of variety *parvifolius* is discussed following the key to the varieties of *O. roraimae*.

KEY TO THE VARIETIES OF *OCHTHOCOSMUS RORAIMAE*

1. Leaf blades of fertile branches oval, 7–13 × 4–8 cm, margins entire or nearly so; panicles 11–14 cm long, 10–12 cm wide; known only from the upper slopes of Cerro Venamo . . . . . *O. roraimae* var. *grandifolius*
1. Leaf blades of fertile branches mostly obovate, 3–10 × 2–6 cm, margins usually noticeably crenate or toothed; panicles 3–8 cm long, 2–5 cm wide; widespread throughout much of the Gran Sabana, also in western Guyana and adjacent Brazil . . . . . *O. roraimae* var. *roraimae*

*Ochthocosmus parvifolius* Hallier f., Beih. Bot. Centralbl. 39 (2). 15. 1921. *Ochthocosmus roraimae* var. *parvifolius* (Hallier f.) Steyermark & Luteyn, Brittonia 32: 135. 1980. TYPE: Guyana or Venezuela ("British Guiana" on label), undershrub 6–10 ft. high, sandstone region, Mt. Roraima, Oct.–Nov. 1842, *Richard Schomburgk 1046* (holotype, B destroyed, photo, US, VEN).

The holotype of *Ochthocosmus parvifolius* Hallier f. at B was destroyed in 1943, and there is apparently no extant duplicate material (inquiries were made at B, BM, G, K, and W). The type photographs are dark and much reduced in size from the original specimen, with no evidence of flowers or inflorescences. Steyermark & Luteyn (1980) treated this as a variety of *O. roraimae*, but the inflorescence, described as just 2.5 cm long, is very short for that species. According to the protologue of *O. parvifolius* and Schomburgk's collection notes in the New York Botanical Garden archives, the type specimen came from a low shrub smaller than the more robust and often tree-like *O. roraimae*. *Ochthocosmus parvifolius* was also described as having unequal sepals, which are characteristic of species such as *O. floribundus* Gleason, but not of *O. roraimae*, which has equal-sized, glandular-margined sepals. *Ochthocosmus floribundus* is not known to occur around Mt. Roraima and is known primarily from areas farther north and west in Estado Bolívar such as Auyán-tepui and Cerro Guiaquinima.

The possibility also exists that *Ochthocosmus parvifolius* is conspecific with a later-described species such as *O. attenuatus* Steyermark & Luteyn, which is known so far only from the type locality near San Rafael de Camoirán in the northern part of the Gran Sabana. Given the current uncertainties concerning the identity of *O. parvifolius*, and until the issue can be better resolved, we recommend that this species be treated as one of uncertain position (incertae sedis).

*Acknowledgments.* We thank Bruno Manara for making the illustrations, the Royal Botanic Gardens at Kew for the Cibachrome type photograph of *Ochthocosmus roraimae*, The New York Botanical Garden for providing a loan of their specimens and copies from the Schomburgk collection notes, and H. Sipman (B), S. Knapp (BM), F. Jacquemoud (G), G. Lucas (K), J. Pruski (US), and H. Riedl (W) for checking for possible type material of *O. parvifolius*. This work was supported in part by National Science Foundation grant BSR-9201044 to the Missouri Botanical Garden. CVG-EDELCA (Electrificación del Caroní, C.A.) kindly provided logistical support for field studies related to this paper.

Literature Cited

Fölster, H. 1992. Holocene autochthonous forest degradation in southeast Venezuela. Pp. 25–44 *in* J. G. Goldammer (editor), Tropical Forests in Transition. Birkhäuser Verlag, Basel.

Forman, L. L. 1965. A new genus of Ixonanthaceae, with notes on the family. Kew Bull. 19: 517–526.

Mabberley, D. J. 1990. The Plant-Book. A Portable Dictionary of the Higher Plants. Cambridge Univ. Press, Cambridge.

Steyermark, J. A. 1984. Flora of the Venezuelan Guayana. I. Ann. Missouri Bot. Gard. 71: 297–340.

———. 1988. Flora of the Venezuelan Guayana. IV. Ann. Missouri Bot. Gard. 75: 311–351.

——— & J. L. Luteyn. 1980. Revision of the genus *Ochthocosmus*. Brittonia 32: 128–143.

# Three New Combinations in *Pfaffia* (Amaranthaceae) from the New World Tropics

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ABSTRACT. The new combinations *Pfaffia aurata* (Martius) Borsch, *Pfaffia completa* (Uline & W. L. Bray) Borsch, and *Pfaffia costaricensis* (Standley) Borsch are made. In analyzing the pollen morphology and floral structures of the three species, it is shown that they belong to *Pfaffia* Martius and not to *Iresine* P. Browne, nom. cons.

*Pfaffia* belongs to Amaranthaceae subfamily Gomphrenoideae (Schinz, 1934; Townsend, 1993). It comprises about 35 species, all characterized by long trichomes arising in tufts from the pedicel or the base of the perianth, a bilobate stigma, and the flowers all being hermaphrodite. The genus is distributed in the New World, according to Stützer's (1935) monograph, ranging from Mexico southwards throughout the tropics, including the Amazon basin, to the region of Bahía Blanca, Argentina.

During preparation of the Amaranthaceae treatment for *Flora de Nicaragua* and subsequent studies in the genera *Pfaffia* and *Iresine*, three new combinations turned out to be necessary.

**Pfaffia aurata** (Martius) Borsch, comb. nov. Basionym: *Trommsdorffia aurata* Martius, Nova Genera et Species Plantarum, Vol. 2: 41. 1826. TYPE: Brazil. Provinciae Rio Negro: habitat in argillosis praeruptis oparatis flu[. . .] Japurá ripis ad Mar[ibis], Dec.–Jan., *C. F. P. v. Martius s.n.* (holotype, M).

**Pfaffia completa** (Uline & W. L. Bray) Borsch, comb. nov. Basionym: *Iresine completa* Uline & W. L. Bray, Bot. Gaz. (Crawfordsville) 21: 349. 1896. TYPE: Honduras. Santa Bárbara: San Pedro Sula, 200 m, *C. Thieme 338* (holotype, US; isotypes, BM, K). Figure 1.

*Iresine wrightii* Standley, Contr. U.S. Natl. Herb. 18: 97. 1916. Syn. nov. TYPE: Nicaragua [Herbarium of the U.S. North Pac. Expl. Exped. under Commanders Ringgold and Rodgers 1853–1856], *C. Wright s.n.* (holotype, US).

**Iresine calea** (Ibáñez) Standley, Contrib. U.S. Natl. Herb. 18: 94. 1916.

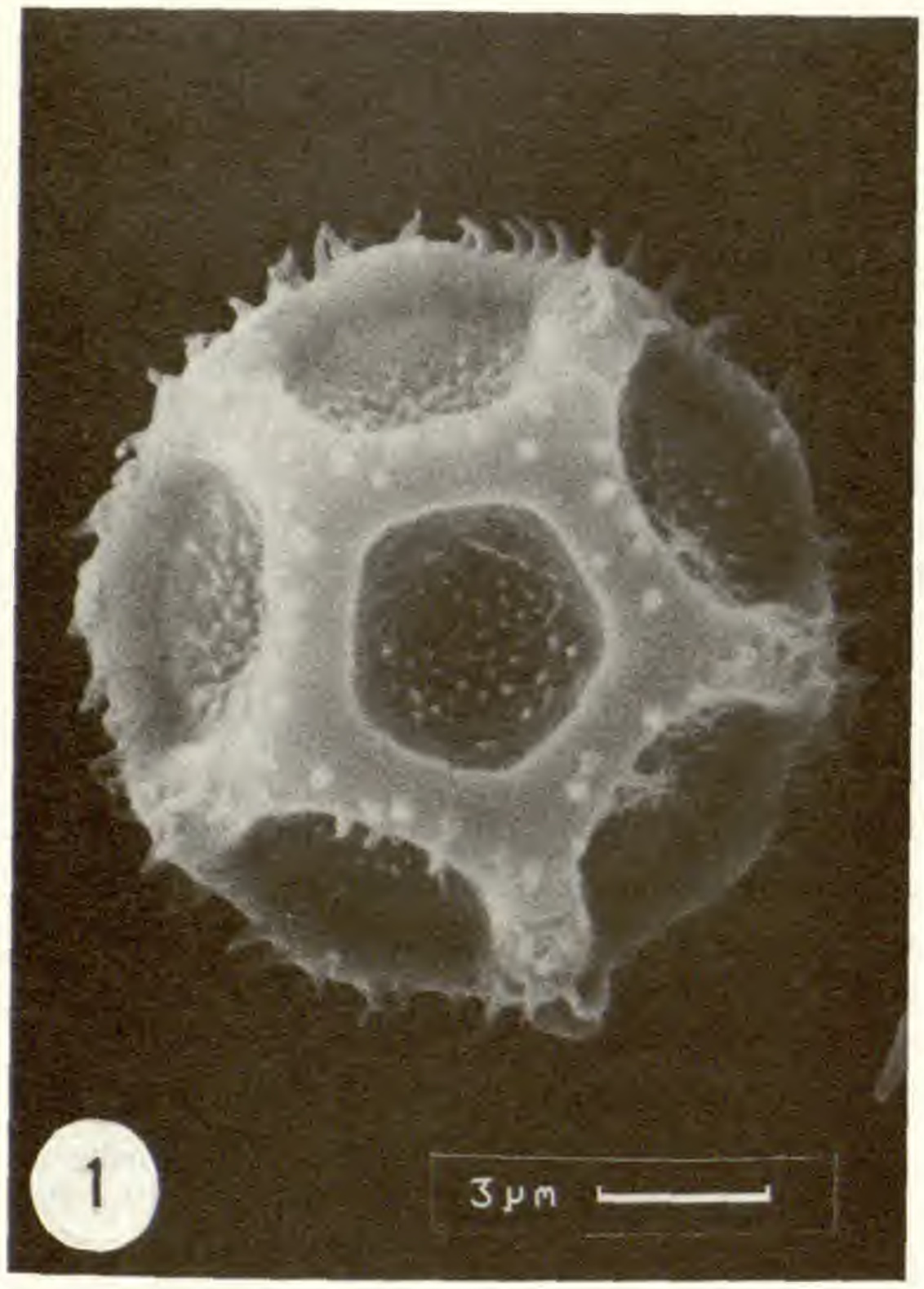
*Iresine completa* Uline & W. L. Bray f. *glabriuscula* Suessenguth, Repert. Spec. Nov. Regni Veg. 39: 11. 1935. Syn. nov. TYPE: Mexico. Mazatlán: Felsige Abhänge, Jan.–Mar. 1902, *C. A. Purpus 362* (holotype, WU).

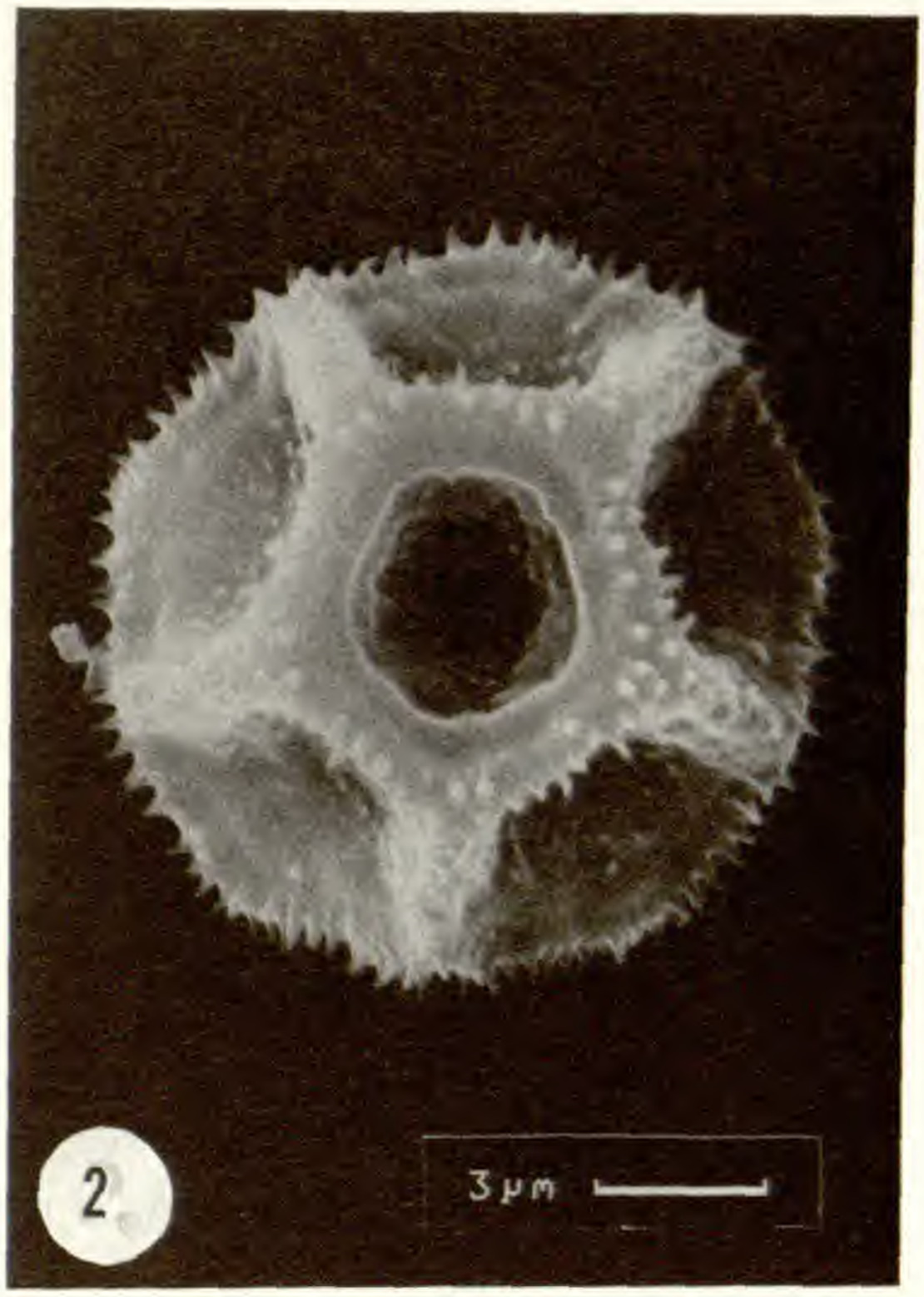
There has been some confusion about the identity of this species because John Donnell Smith renumbered Thieme's specimen (*Thieme 338*) with his own number, 5443. There is a second collection by Thieme from the same locality in Honduras, renumbered 5447. Suessenguth (1934) erroneously cited "*Donnell-Smith n. 5447*" as the type. This specimen (BM, US) is a functionally male plant of *Iresine calea* (Ibáñez) Standley. It has small pistillodes and might have been interpreted as being hermaphroditic for that reason, but the plant lacks the long basal trichomes that in hermaphroditic or functionally female flowers of all species of *Iresine* serve for wind dispersal. Obviously, this specimen cannot be the type mentioned by Uline & Bray (1896). In line with his misinterpretation, Suessenguth (1935) described *Iresine completa* Uline & W. L. Bray f. *glabriuscula* Suessenguth from a specimen that is a functionally male plant of *Iresine calea*.

When publishing *Iresine completa*, Uline & Bray (1896) stressed the complete hermaphroditism of their plant, a remarkable character in contrast to the many species belonging to *Iresine* which are dioecious or polygamous. It is obvious that they called it "*completa*" for that reason.

**Pfaffia costaricensis** (Standley) Borsch, comb. nov. Basionym: *Iresine costaricensis* Standley, Contrib. U.S. Natl. Herb. 18: 94. 1916. TYPE: Costa Rica. Tucurrique, Buissons à Las Vueltas, 635 m, Mar. 1899, *A. Tonduz 13183* (holotype, US; isotypes, K, US). Figure 2.

*Pfaffia aurata*, *P. completa*, and *P. costaricensis* show the bilobate stigma, which is a distinguishing character of *Pfaffia*. In *P. aurata* the lobes have almost the outline of an equilateral triangle. In *P. completa* the lobes are narrowly triangular, and in *P. costaricensis* the stigma is shaped more or less




Figures 1, 2. Scanning electron (SEM) photomicrograph of air-dried pollen. —1. *Pfaffia completa* (*Thieme 338*, BM). —2. *P. costaricensis* (*Tonduz 13183*, K).

like a mushroom cap and the lobes are very short and broad. All three species have subequal, 3-veined tepals with a tuft of long, straight and stiff simple trichomes arising abaxially at the base of the tepal and from the pedicel. The flowers are always hermaphroditic. Duke's (1961) suspicion that *P. completa* could be a polygamous species with the pistillate flowers perfect and the staminate flowers bearing pistillodes is a result of the above-mentioned confusion about the species' identity. In all three species the filaments are united at the base into a shallow cup. Broadly rounded pseudostaminodia are present, which are distinctly shorter than the free part of the filament. Sometimes they are notched at the apex or they are indistinct and the margin of the cup is only slightly raised.

The pollen grains of *Pfaffia aurata*, *P. completa* (Fig. 1), and *P. costaricensis* (Fig. 2) are pantoporate, having 12–14, 5-angular lumina and sunken pores. They represent the *Gomphrena*-type, one of two major pollen types in the Amaranthaceae (Erdtman, 1952). The *Gomphrena*-type is placed in a specialized category in Nowicke's (1975) study of centrospermous pollen. *Pfaffia* has pollen of the *Gomphrena*-type, whereas pollen of *Iresine* is similar to the *Amaranthus*-type of Erdtman, which corresponds to Pollen-Type II of Nowicke (1975). In *Pfaffia aurata*, *P. completa*, and *P. costaricensis*, the tectum appears to cover the columellae completely and the muri have more or less vertical sides. The extraporal sexine bears distinct elongate spinules in all three species. This is exactly the same structure as in species of *Pfaffia* (see illustrations of *Pfaffia* pollen by Nowicke & Skvarla (1979), Cuadrado (1988), Eliasson (1988), and Townsend (1993)). There is only variation in aperture number, which is known to occur between species within many genera of Amaranthaceae. Eliasson (1988) showed *Pfaffia*-pollen to have a row of warts or spinules on the distal part of their tectum. In *P. aurata*, a species illustrated by Eliasson as figure 34 under the misapplied name *Pfaffia paniculata* (Martius) Kuntze, these rows are not very straight. In investigating more specimens of *P. aurata* from different localities the same observation was made. Sometimes the spinules were in an undulate row, some of them even side by side. The pollen of *P. costaricensis* (Fig. 2) also has some of the spinules side by side, but there is a certain amount of variation, from a side by side arrangement of the spinules to straight rows, even within a number of grains from a single anther. In contrast to *Iresine*,

the spinules are never evenly spread over a more or less convex distal part of the tectum. In *Iresine* the pores are small and apertures cover a minor part of the surface of the grain. *Iresine angustifolia* Euphrasén has more specialized pollen with wider pores, compared to the other species of the genus, but the distal parts of the tectum are still convex and the spinules are evenly spread.

*Pfaffia aurata, P. completa,* and *P. costaricensis* are closely related and belong to a group that was described as *Trommsdorffia* by Martius (1826). In 1839 Dietrich transferred *Trommsdorffia aurata* Martius (the type species of *Trommsdorffia*), *T. argentata* Martius, and *T. pulverulenta* Martius to *Iresine* P. Browne. Similarities in habit (all species being scandent shrubs or lianas), several times branched racemose inflorescence structures, and the common occurrence of long trichomes serving for dispersal were the decisive factors for merging the two genera. My own studies in connection with a revision of *Iresine* revealed that *Trommsdorffia* is different from *Iresine* not only in pollen morphology but also in floral structure, most strikingly in the morphology of the stigma (two more or less elongated, filiform branches). *Iresine* and *Trommsdorffia* belong to completely different evolutionary lines. This is also supported by the strong trend to the evolution of polygamous or dioecious species in *Iresine,* whereas the relatives of *Pfaffia aurata* and all other species of *Pfaffia* are generally hermaphroditic. Consequently, *Trommsdorffia* has to be excluded from *Iresine. Trommsdorffia pulverulenta* Martius (= *Pfaffia densipellita* Borsch), a morphologically well defined species also allied to *P. aurata* from Peru, was excluded from *Iresine* earlier (Borsch, 1993).

*Pfaffia aurata* and its allies form a small group of closely related species within the genus *Pfaffia.* Differences from the other species of *Pfaffia* are merely a matter of degree. The occurrence of more or less broadly rounded pseudostaminodia in *P. aurata* and its relatives is not sufficient to support generic status. Their position within the genus *Pfaffia* and the generic concept of *Pfaffia* will be discussed in detail in a separate paper. It is questionable whether *Trommsdorffia argentata* Martius is specifically distinct from *Pfaffia aurata,* and several other morphologically very similar taxa (e.g., *Iresine argentata* (Martius) D. Dietrich var. *amazonica* Seubert = *Iresine aurata* (Martius) D. Dietrich var. *amazonica* (Seubert) Suessenguth) are being studied more thoroughly before a taxonomic decision is made as to their status among the relatives of *P. aurata.*

*Pfaffia aurata* has tepals that are ovate-oblong, 3-veined, 1.3–1.8 mm long and stigma lobes that have more or less the outline of an equilateral triangle. *Pfaffia completa* is characterized by its tepals, which are narrowly triangular, prominently 3-veined, about 2.5 mm long, narrowly triangular stigma lobes becoming almost cylindrical at top, and broadly lanceolate blades, which are glabrous on the upper and sparsely pubescent on the lower surface. *Pfaffia costaricensis* has extremely small floral parts and conspicuously finely branched inflorescences, representing 3–4 times branched racemose structures with strictly opposite branches. The tepals are ovate, 1.1–1.3 mm long, and indistinctly 3-veined. The stigma lobes are very broadly rounded, even shorter and broader than in *P. aurata.* The anthers have a length of 0.2 mm, in contrast to the other species, which have anthers that are about 0.4 mm long. Burger (1983) described the characteristic elliptic or broadly elliptic leaf blades of *P. costaricensis,* with up to 12 pairs of major secondary veins.

*Pfaffia aurata* probably ranges throughout the Neotropics. In Ecuador the species is well established in virgin forests as well as rastrojos, according to the *Flora of Ecuador* (Eliasson, 1987). There the species is erroneously called *Pfaffia paniculata* (Martius) Kuntze, a name of a different taxon belonging to a group of closely related species that were described as *Hebanthe* by Martius (1826). Suessenguth (1934) described *Pfaffia completa* as occurring from Guatemala to Costa Rica. This range is partly a consequence of the misinterpretation of the species's identity. In herbaria many older specimens identified as *Iresine completa* Uline & W. L. Bray belong in fact to *Iresine calea* (Ibáñez) Standley. Apart from the type locality in Honduras, *Pfaffia completa* is at the moment proven to occur in Nicaragua and Panama. Two specimens exist from Nicaragua. One has been collected recently on Isla de Ometepe in Lago de Nicaragua, and the other is the type of *Iresine wrightii.* The single specimen from Panama has been collected in the Darién and is also cited by Duke (1961). *Pfaffia costaricensis* is endemic to Costa Rica and is known only from the central part of the country (Burger, 1983). A recent collection has been made in a remote area in Puntarenas, where the plant was climbing on secondary woody vegetation (Hammel, pers. comm.).

*Additional specimens examined.* **Iresine calea** (Ibáñez) Standley (specimens incorrectly identified as *Iresine completa* Uline & W. L. Bray): COSTA RICA. **Puntarenas:** Santo Domingo de Golfo Dulce, *Tonduz 9861* (BM). HONDURAS. **Santa Bárbara:** San Pedro Sula, *Thieme s.n.,* renumbered by Donnell Smith *5447* (BM,US). NIC-

ARAGUA. **Managua:** S of Managua, *J. M. & M. T. Greenman 5725* (MO). ***Pfaffia aurata*** (Martius) Borsch: NICARAGUA. **Boaco:** San José de los Remates, *Moreno 20337* (MO). **Rivas:** Isla de Ometepe, al NE del Volcán Concepción, *Sandino 4233* (FR, HNMN not seen). **Zelaya:** La Pimienta, *Pipoly 6291* (FR); along new road from Siuna to Matagalpa, ca. 31.4 km beyond Río Uli, near Wani, *Stevens 7493* (FR). ***Pfaffia completa*** (Uline & W. L. Bray) Borsch: NICARAGUA. **Rivas:** Isla de Ometepe, Volcán Madera, *Robleto 291* (FR, MO). PANAMA. **Darién:** Paca, *Williams 706* (US). ***Pfaffia costaricensis*** (Standley) Borsch: COSTA RICA. **Puntarenas:** Canton de Osa, Fila Costeña, Fila Cruces, cabezeras del Río Piedras Blancas, *Hammel 19289* (MO).

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Literature Cited

Borsch, Th. 1993. Amaranthaceae. Pp. 18–26 + Appendix I *in* L. Brako & J. L. Zarucchi, Catalogue of the Flowering Plants and Gymnosperms of Peru/Catálogo de las Angiospermas y Gimnospermas del Perú. Monogr. Syst. Bot. Missouri Bot. Gard. 45.

Burger, W. C. 1983. Amaranthaceae. *In:* Flora Costaricensis. Fieldiana, Bot. 13: 142–180.

Cuadrado, G. A. 1988. Granos de polen de Amaranthaceae del nordeste Argentino: 2. Género *Pfaffia*. Bol. Soc. Argent. Bot. 25(3–4): 385–394.

Dietrich, D. 1839. Synopsis Plantarum. Vol. 1. Bernhard Friedrich Voigt, Weimar.

Duke, J. A. 1961. Amaranthaceae. *In:* Flora of Panama. Ann. Missouri Bot. Gard. 48: 6–50.

Eliasson, U. H. 1987. Amaranthaceae. Pp. 1–138 *in* G. Harling & L. Andersson, Flora of Ecuador, Vol. 28. Berlings, Älöv.

———. 1988. Floral morphology and taxonomic relations among the genera of Amaranthaceae in the New World and the Hawaiian Islands. J. Linn. Soc., Bot. 96: 235–283.

Erdtman, G. 1952. Pollen Morphology and Plant Taxonomy. Angiosperms. Almqvist & Wiksell, Stockholm.

Martius, C. F. P. von. 1823–1832. Nova Genera et Species Plantarum. 3 Vols. Lindauer et Wolf, Monachii.

Nowicke, J. W. 1975. Pollen morphology in the order Centrospermae. Grana 15: 51–77.

——— & J. J. Skvarla. 1979. Pollen morphology: The potential influence in higher order systematics. Ann Missouri Bot. Gard. 66: 633–700.

Schinz, H. 1934. Amaranthaceae. Pp. 7–85 *in* A. Engler & K. Prantl, Die natürlichen Pflanzenfamilien, ed. 2, 16c. Leipzig.

Stützer, O. 1935. Die Gattung *Pfaffia*. Repert. Spec. Nov. Regni Veg. Beih. LXXXVIII, 1–46. Berlin.

Suessenguth, K. 1934. Neue und kritische Amarantaceen aus Süd-und Mittelamerika. Repert. Spec. Nov. Regni Veg. 35: 298–337.

———. 1935. Neue und kritische Pflanzen aus Südamerika, insbesondere Amarantaceen, sowie eine neue Gattung der Podostemonaceae. Repert. Spec. Nov. Regni Veg. 39: 1–20.

Townsend, C. C. 1993. Amaranthaceae. Pp. 70–91 *in* K. Kubitzki et al., Families and Genera of Flowering Plants, Vol. 2. Springer, Berlin.

Uline, E. B. & W. L. Bray. 1896. Synopsis of North American Amaranthaceae V. Bot. Gaz. (Crawfordsville) 21: 348–356.

# *Paspalum morichalense* (Poaceae: Paniceae), a New Aquatic Species from South America

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ABSTRACT. *Paspalum morichalense* is described, illustrated, and compared to related species of the group Dissecta. It occurs in Venezuela, Surinam, Brazil, and Bolivia. Its confusion with *Paspalum commutatum* Nees and *Paspalum lacustre* Chase ex Swallen is discussed.

We have been aware for some time of the existence of a possibly undescribed, aquatic species of *Paspalum* L. However, because of its confusion with two other species, *P. commutatum* and *P. lacustre,* it was not possible to describe it until the types of those two names had been studied. *Paspalum* is a largely American genus with approximately 330 species. The group names used in this paper are the ones used by Chase (1929, ined.) in her infrageneric classification of the genus.

**Paspalum morichalense** Davidse, Zuloaga & Filgueiras, sp. nov. TYPE: Venezuela. Guárico: ca. 32 km SSE of Calabozo on Finca Becerra, in and around morichal with standing water, morichal dominated by *Mauritia flexuosa,* 65 m, 6 Nov. 1973, *Davidse 3770* (holotype, MO; isotypes, AAU, K, LE, MEXU, MG, PRE, SI, US, VEN). Figure 1.

Gramen perenne, repens vel fluitans, aquaticum; culmi 13–25 cm alti, ramosi. Folia caulina; ligulae 0.6–2.0 mm longae, glabrae. Racemi 1–2, 3–6 cm longi; rhachis 1.1–3.5 mm lata, alata, herbacea, scaberula. Spiculae 2.1–2.9 × 0.9–1.1 mm, ellipticae, singulares, non imbricatae, glabrae, acutae. Antherae 3, 0.5–0.8 mm longae, purpureae.

Creeping or floating, aquatic perennial. Culms many-noded, decumbent and rooting at the lower nodes, freely branching, the erect portion of the culms 13–25 cm tall; internodes hollow, glabrous; nodes dark, glabrous or sparsely pilose. Leaves cauline. Sheaths 2–8 cm long, glabrous, slightly keeled; collar dark glabrous. Ligules 0.6–2.0 mm long, membranous, truncate, glabrous. Blades 3.5–11 cm long, 1.5–3 mm wide, linear to linear-lanceolate, flat, narrowed at the base, widely spreading to reflexed, glabrous to scabrous on the adaxial surface and glabrous on the abaxial surface, the margins scaberulous. Inflorescence terminal, partially included in the upper leaves; peduncle 2 cm long, cylindric; racemes 1–2, 3–6 cm long; rachis 1.1–3.5 mm wide, winged, herbaceous, green, inconspicuously veined, glabrous, terminating in a spikelet, the margins minutely scaberulous, usually folded and partially embracing the spikelets, the spikelets not crowded, not overlapping on the same side of the rachis; pedicels solitary, 0.3–0.5 mm long, scaberulous. Spikelets 2.1–2.9 mm long, 0.9–1.1 mm wide, elliptic, concave-convex, broadly acute, whitish green, glabrous. Lower glume absent. Upper glume and lower lemma subequal or the upper glume 0.1–0.2 mm shorter than the upper floret, hyaline, 3–5-nerved, with one central nerve and with the submarginal and marginal nerves close together. Lower floret sterile. Lower lemma 5-nerved. Lower palea absent. Upper floret 2.1–2.8 mm long, 0.9–1.1 mm wide, as long as the spikelet, bisexual, elliptic, acute, whitish, indurate, smooth and shining, papillose and with prickle hairs and bicellular microhairs at the apex; lodicules 2, 0.3 mm long, truncate. Stamens 3; anthers 0.5–0.8 mm long, purple. Styles 2, separate; stigmas ca. ½ as long as the styles, plumose, purple. Caryopsis 1.6–1.8 mm long, 0.9 mm wide, elliptic, brownish; hilum ca. ⅔ as long as the caryopsis, linear; embryo ca. ⅓ as long as the caryopsis.

This species is known from Venezuela to Brazil and Bolivia. We have studied it in the field in Guárico, Venezuela, and Bahia, Brazil. In Guárico it grows on mud and in shallow water of swamps and

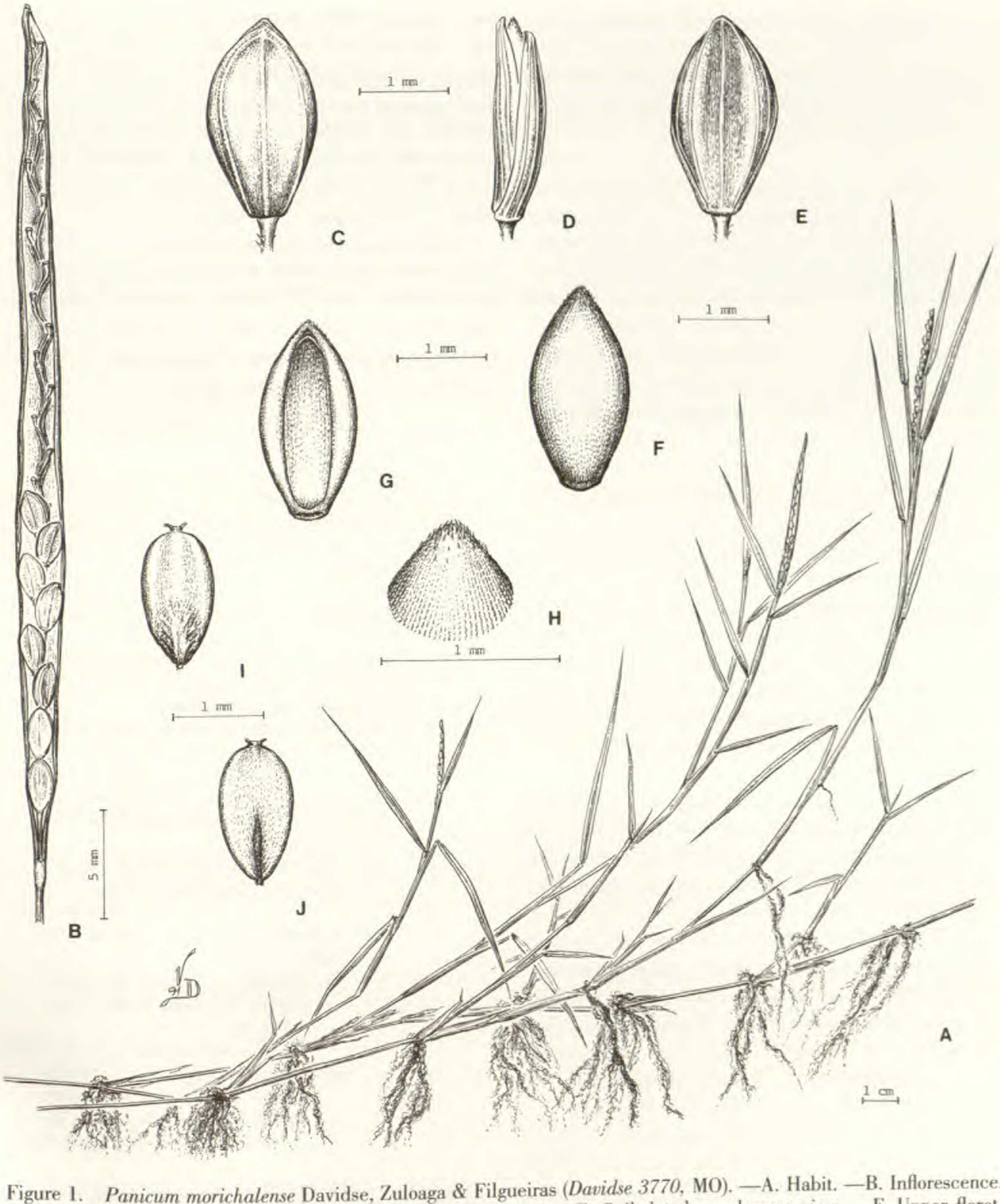


Figure 1. *Panicum morichalense* Davidse, Zuloaga & Filgueiras (*Davidse 3770*, MO). —A. Habit. —B. Inflorescence. —C. Spikelet, upper glume view. —D. Spikelet, lateral view. —E. Spikelet, lower lemma view. —F. Upper floret, lemma view. —G. Upper floret, palea view. —H. Detail of apex of the upper lemma. —I. Caryopsis, embryo side. —J. Caryopsis, hilum side.

ponds at an elevation between 65 and 125 m, especially in morichales, palm swamps dominated by *Mauritia flexuosa* L. f. (Arecaceae). The Bahian gathering was collected at an elevation of approximately 450 m in a pond ca. 20 m across and ca. 1–2 m deep. Here it grew at the edges and at the center of the pond and was much sought after by cattle and horses. The latter entered into the deeper waters of the pond to reach the soft, floating culms.

The specific epithet is derived from the word morichal, which is the Venezuelan designation for a *Mauritia* swamp. The equivalent Brazilian vegetation type is commonly known as vereda.

Because of its few racemes, foliaceous, winged

rachis, aquatic habit, creeping or floating culms with many elongated nodes, and glabrous spikelets, *Paspalum morichalense* belongs to the informal group Dissecta of Chase (1929). Within this group it is most closely related to *P. lacustre* and *P. dissectum* (L.) L.

*Paspalum lacustre* differs from *P. morichalense* by its more numerous racemes (4–6 vs. 1–2), spikelets sharply acute (vs. broadly acute), the upper floret shorter than the upper glume and lower lemma (0.4–0.9 mm shorter vs. as long as or only 0.2 mm shorter), longer pedicels (ca. 1.0 mm vs. 0.3–0.5 mm), and rachis scabrous versus minutely scaberulous. *Paspalum lacustre* is known only from the type collection [BRAZIL. **Amapá**: Mun. Macapá, Ambé, localidade no afluente do Rio Pedreira, em lago fundo, 8 jul. 1951, *R. L. Fróes & G. A. Black 27312* (holotype, INPA not seen, fragment US; isotype, US)].

*Paspalum dissectum* differs from *P. morichalense* in its more numerous racemes (2–4 vs. 1–2), spikelets generally smaller (1.8–2.2 × 1.2–1.5 vs. 2.1–2.9 × 0.9–1.1 mm), obovate (vs. elliptic), and more densely arranged (i.e., overlapping in the same row on one side of the rachis vs. not overlapping in one row), veins more strongly developed in the rachis wings, and the rachis wing margins scabrous (vs. minutely scaberulous).

Although specimens of *Paspalum morichalense* have been known at least since the 1864 collection of Warming in Brazil, the species has remained formally unrecognized until now and has been confused with two other species. As noted by Chase (ined.), Doell (1877) in *Flora Brasiliensis* partially misapplied the name *Paspalum commutatum*. Under this species he correctly cited a Riedel collection, but also included the Warming collection. *Paspalum commutatum*, as shown by an examination of a fragment of the holotype [BRAZIL: pr. Porto Est. locis tempore pluviore inundatis ... *Langsdorff s.n.* (holotype, LE not seen, fragment US)], belongs to the group Plicatula of Chase (1929) because it has compressed sheaths, 4–5 racemes, broadly obovate spikelets, and a dark brown, shining upper floret. There is no close relationship between groups Dissecta and Plicatula.

As shown by her annotations and her unpublished manuscript, Chase (ined.) recognized that *P. morichalense* was an undescribed species, but she did not differentiate it from *P. lacustre*, a concept also followed by Judziewicz (1990). On the other hand, Swallen (1967), who effectively published *P. lacustre*, apparently did distinguish between *P. morichalense* and *P. lacustre*, since he cited only the type collection, *Fróes & Black 27312*, under his new species. Unfortunately, he mistakenly classified this species as a member of the Plicatula group. In annotations of the US specimens Chase had equated the two collections of Fróes and Black (*27195* and *27312*) under the same, unpublished name. We, on the other hand, include *Fróes & Black 27195* under *P. morichalense*, and *Fróes & Black 27312* under *P. lacustre*.

As noted earlier, the description of *P. lacustre* in Judziewicz (1990: 484) is based on a mixture of *P. morichalense* and *P. lacustre*, but the illustration (fig. 84A–C) represents only *P. morichalense*.

These species of group Dissecta may be distinguished through the following key:

1a. Rachis of the raceme extending beyond the spikelets as a naked point.
  2a. Spikelets 0.6–0.8 mm wide, in 2 rows; United States to Argentina . . . . . *P. repens* Bergius
  2b. Spikelets 0.8–1.2 mm wide, in 1 row; Mexico (Nayarit to Chiapas) . . . *P. longicuspe* Nash
1b. Rachis ending in a spikelet.
  3a. Upper floret as long as the lower lemma and upper glume or at most 0.1–0.2 mm shorter; Venezuela, Surinam, Brazil, Bolivia . . . *P. morichalense* Davidse, Zuloaga & Filgueiras
  3b. Upper floret at least 0.2 mm shorter than the lower lemma and upper glume.
    4a. Spikelets on the same side of the rachis not overlapping; Brazil (Amapá) . . . . . *P. lacustre* Chase ex Swallen
    4b. Spikelets on the same side of the rachis overlapping, especially toward the base of the rachis.
      5a. Spikelets 1.8–2.2 mm long, obtuse; eastern United States, Cuba . . . . . *P. dissectum* (L.) L.
      5b. Spikelets 3–3.9 mm long, acuminate.
        6a. Racemes 2, rarely 1; blades mostly 3–6 mm wide; Cuba, Jamaica . . . . . *P. serratum* Hitchcock & Chase
        6b. Racemes 3–5, rarely 2; blades mostly more than 8 mm wide; southern United States to Argentina . . . *P. acuminatum* Raddi

*Paratypes.* VENEZUELA. **Bolívar:** small swamp in open savanna at base of Serranía de Pijiguao, 160 km SW of Caicara del Orinoco, 6°35'N, 66°45'W, 100–125 m, 12 Sep. 1985, *Steyermark, Holst & Manara 131802* (MO, VEN). **Guárico:** 48 km N of Santa Rita along Hwy. 12 between Cabruta and Chagauramas, shallow pond with standing water in *Trachypogon* savanna with *Curatella* and *Bowdichia*, 110 m, 21 Nov. 1973, *Davidse 4287* (COL, K, MO, P, RB, US, VEN). SURINAM. Sipaliwini, savannah, 30 Jan. 1965, *Fraser 3* (US). BRAZIL. **Amapá:** Mun. de Macapá, Rio Macacoari, São Benedito do Braço, 4 Jan. 1951, *Fróes & Black 27195* (US). **Bahia:** natante na lagoa Pipiri, Rio Santa Clara, 17 Dec. 1987, *Filgueiras 1295* (CEN, IBGE, K, SP). **Minas Gerais:** Lagoa Santa, in aquis stagnantibus, fluitans, 5 Apr. 1864, *Warming s.n.* (US). **Mato Grosso:** just S of the Rio Suia Missu Ferry,

ca. 40 km NW of base camp at 12°49′S, 51°46′W, edge of small lake in shallow water, grass with weak procumbent rooting stems with ascending culms, 24 Nov. 1968, *Harley 11213* (MO, UB, US). **Mato Grosso do Sul:** Mun. de Corumbá, Fazenda Santa Delfina, erva prostrada, pouco arraigada ao solo, frequente em vaçante seca, solo arenoso, 3 Dec. 1978, *Allem, Valls, Vieira & Comastri 2557* (CEN, MO); Mun. de Corumbá, Fazenda São Bento, erva prostrada, pouco arraigada ao solo, frequente em vazcante seca, 2 Nov. 1978, *Allem, Valls, Vieira & Comastri 2529* (CEN, MO). **Pará:** Gavinho, Marajó Island, Mar. 1920, *Goeldi 284* (US). BOLIVIA. Río Guarapé, Santo Antonio de Manoelito, 25 Jun. 1952, *Black & Cordeiro 52-15320* (US).

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Literature Cited

Chase, A. 1929. The North American species of *Paspalum*. Contr. U.S. Natl. Herb. 28: 1–310, i–xvii.

———. Ined. *Paspalum* of South America. Unpublished manuscript. Hitchcock and Chase Library, Botany Department, Smithsonian Institution, Washington, D.C.

Doell, J. C. 1877. Paniceae. *In:* C. F. P. Martius, Fl. Bras. 2(2): 33–358.

Judziewicz, E. J. and collaborators. 1990. Poaceae (Gramineae). Fl. Guiananas, Ser. A: Phanerogams 8: 1–727.

Swallen, J. R. 1967. New species of *Paspalum*. Phytologia 14: 358–389.

# A New Species of *Brachynema* (Olacaceae) from South America

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ABSTRACT. A new species is described and illustrated in the previously monotypic genus *Brachynema* (Olacaceae). *Brachynema axillare* is known from the base of Sierra de la Neblina in southern Venezuela and northern Brazil, as well as in Amazonian Peru; it differs from *B. ramiflorum* Bentham in its axillary inflorescences, non-striped corolla tube, glabrous corolla lobes, and mostly 4-merous flowers.

RESUMEN. Se describe una nueva especie en el género *Brachynema* (Olacaceae), previamente considerado monotípico. *Brachynema axillare* se conoce de la base de la Sierra de la Neblina en el sur de Venezuela y en el norte de Brasil, así como en la Amazonía peruana. Difiere de *B. ramiflorum* en sus inflorescencias axilares, tubo de la corola no rayado, lóbulos de la corola glabros, y las flores mayormente 4-meras.

In the most recent revision of neotropical Olacaceae (Sleumer, 1984), *Brachynema* was considered monotypic and endemic to central Amazonian Brazil. In a series of expeditions to the Sierra de la Neblina in southern Venezuela between 1984 and 1987 (Brewer-Carías, 1988), numerous additional collections of the genus were made and subsequently determined as *Brachynema ramiflorum* Bentham. However, more detailed study revealed that the Venezuelan specimens are significantly different from this species and merit recognition as a distinct species, due to their axillary (vs. ramiflorous), often tetramerous (vs. strictly pentamerous) flowers, tricolpate instead of triporate pollen (Lobreau-Callen, 1980), larger fruits, smaller calyx at anthesis, glabrous corolla lobes (vs. internally hairy), and the base of the corolla tube purple and lacking the characteristic "zebra" stripes of *B. ramiflorum*.

**Brachynema axillare** R. Duno & P. E. Berry, sp. nov. TYPE: Venezuela. Estado Amazonas: Dpto. Río Negro, 0 to 2 km W of Cerro La Neblina Base Camp, along Río Mawarinuma, 0°50′N, 66°10′W, 140 m, 7 Feb. 1984, *Liesner 15707* (holotype, VEN; isotype, MO). Figure 1.

Haec species *Brachynemati ramifloro* Bentham affinis, sed ab eo inflorescentia axillari non ramiflora, floribus plerumque tetrameris, corollae lobulis glabris etiam tubo basaliter purpureo, polline tricolpato differt.

Sparsely branched shrub or small tree 3–8 m tall. Leaves chartaceous, simple, alternate, glabrous, estipulate; blade narrowly to broadly elliptic or ovate, 20–40 cm long, 5–20 cm wide, base rounded to cuneate, apex long-acuminate to caudate, the tip often somewhat curved to one side, penninerved, with 9–13 subopposite to alternate pairs of parallel secondary veins looping near the margin to form a submarginal vein, prominent on the lower surface, sunken on the upper surface, tertiary veins conspicuous and running perpendicular to the secondary veins; margin shallowly to prominently sinuate-dentate, each tooth ending in a gland; petiole (1–)3–25 cm long, terete, noticeably thickened at both the base and the apex. Inflorescence an axillary fascicle or dense corymb of 10–20 flowers on a thickened, glabrous to puberulous axis 5–10 mm long. Flowers actinomorphic, bisexual, 4- or 5-merous; pedicels 1–2.5 mm long. Calyx cupular, greenish white when fresh, shallowly lobed, ca. 0.5 mm tall and 2 mm wide at anthesis. Corolla tube 16–25 mm long at anthesis, firm-fleshy when fresh, 2–4 mm wide at the base, glabrous to puberulous, uniformly violet-purple at the base, turning white toward the rim, the lobes white, glabrous, 4–6 mm long. Stamens 4 or 5, epipetalous, included at the base of the tube, filaments ca. 1 mm long; anthers basifixed, ca. 3 mm long, narrowly pointed at the apex, longitudinally dehis-

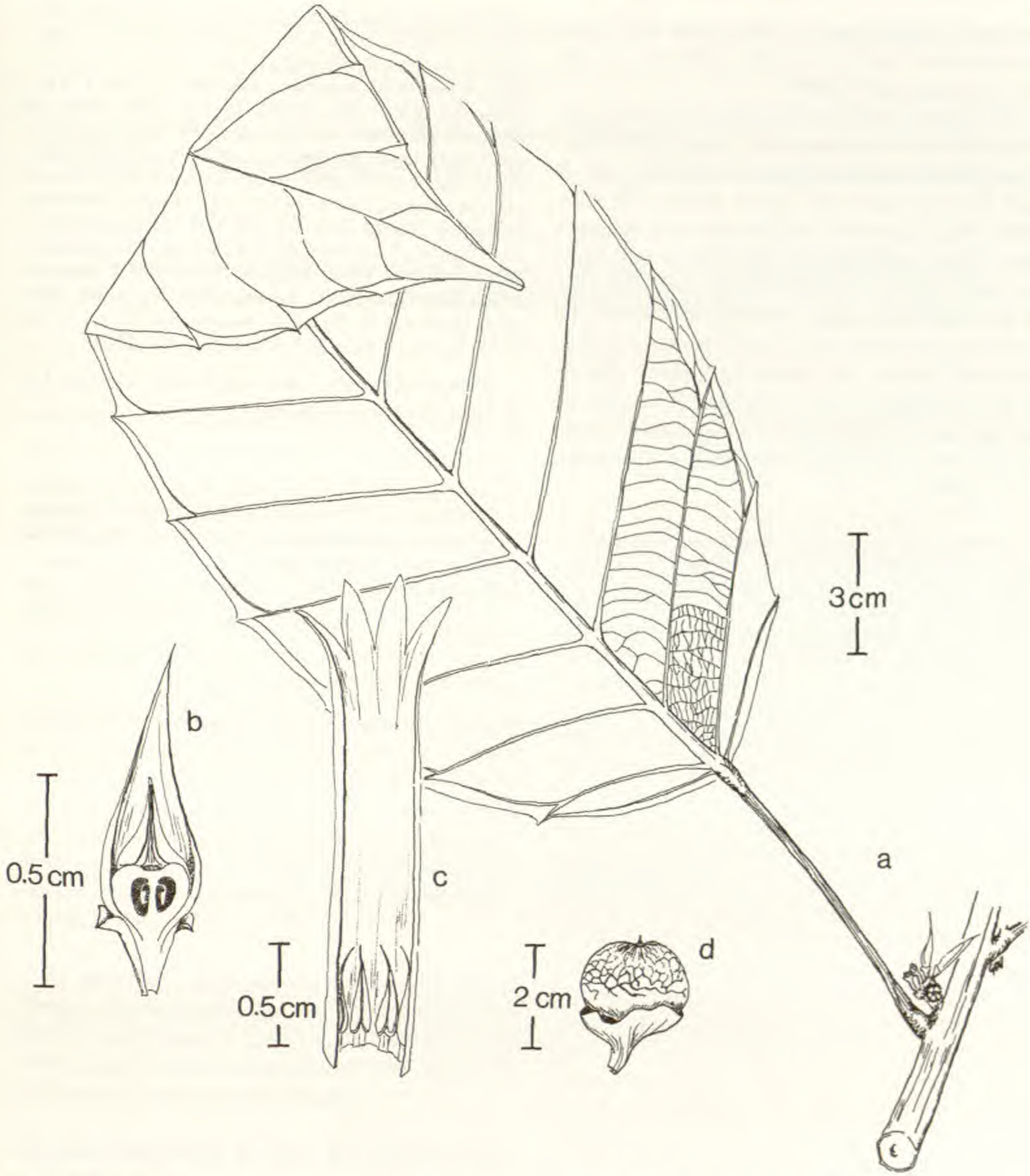


Figure 1. *Brachynema axillare* R. Duno & P. E. Berry. —a. Leafy branch showing the axillary inflorescence with buds. —b. Floral bud in longitudinal section. —c. Opened corolla showing the stamens at the base of the tube. —d. Fruit with the enlarged calyx. Drawing by Giovannina Orsini Velásquez.

cent; pollen suboblate, polar axis 22.5 $\mu$m long, equatorial axis 28.7 $\mu$m long, circular or subtriangular in polar view, tricolpate, the colpi broadened, 14 $\mu$m long by 5 $\mu$m wide, exine very finely reticulate or psilate, 3 $\mu$m thick, without apertural thickenings. Ovary subglobose, 3–5-locular; ovules 1 per locule, pendulous; stigma sessile, capitate. Drupe globose or depressedly globose with a pointed apical projection, 2–2.5 cm diam., green to purple-black when fresh, the calyx enlarged and persistent, surrounding the lower part of the fruit. Seed 1, subglobular, longitudinally striate, 1.5–2 cm diam.

*Ecology and distribution.* Evergreen lowland forest on slopes and along gravelly and silty riverbanks, 100–200 *m* elevation, known mainly from the base of Sierra de la Neblina in adjacent parts of Estado Amazonas, Brazil, and Estado Amazonas,

Venezuela; also known in Amazonian Peru from Departamento Loreto near the confluence of the Ríos Marañon and Ucayali.

*Brachynema* is still of uncertain placement in the Olacaceae and is unique in the family in its glandular-dentate leaves and pulvinar thickenings at both the base and apex of the petiole (Sleumer, 1984). The leaves of *B. axillare* are very similar to those of *B. ramiflorum*, but the flowers and fruits are always borne near the ends of young branches in the leaf axils, rather than lower down on the trunk or on branches where the leaves have already dehisced. Neither the distinctive "zebra" striping of the lower part of the corolla of of *B. ramiflorum* nor the lines of hairs present on the inside of the corolla lobes have been observed in any specimen of *B. axillare*.

*Paratypes.* VENEZUELA. **Amazonas:** 0–2 km E of Cerro La Neblina Base Camp, on Río Mawarinuma, 0°50′N, 66°10′W, 140 m, 7 Feb. 1984, *Liesner 15707* (MO), 20 Feb. 1984, *Liesner 16136* (MO, VEN); along Río Baria (= Río Mawarinuma) just upstream from Base Camp, SW side of Cerro de La Neblina, 0°49′50″N, 66°09′40″W, 140 m, 10 Apr. 1984, *Gentry & Stein 46512* (MO), 11 Apr. 1984, *Thomas & Plowman 3002* (MO, NY), 16 Apr. 1984, *Gentry & Stein 46668* (MO), 4–5 July 1984, *Davidse & Miller 27009* (MO), 27 Nov. 1984, *Croat 59373* (MO), 4 Dec. 1984, *Anderson 13480* (MICH, MO), 17 Feb. 1985, *Nee 30915* (MO, VEN), 18 Feb. 1985, *Boom & Weitzman 5894* (MO, NY), *Stannard 459* (VEN), *Stannard 460* (VEN); upper Río Baría, ca. 0°55′N, 66°15′W, *Davidse & Miller 26908* (MO); Cerro de la Neblina, lowland and slope forests, 170 m, 29 Jan. 1954, *Maguire, Wurdack & Bunting 37401A* (MO, NY). BRAZIL. **Amazonas:** Serra da Neblina Base Camp on Cano Tucano, Rio Cauaburí, 125 m, 12 Nov. 1965, *Maguire, Steyermark & Maguire 60160* (MO, NY). PERU. **Loreto:** Dtto. Nauta, Río Marañon, Quebrada de Sapira del caserío Florida, ca. 8 km above Nauta, 13 June 1979, *Rimachi 4465* (MO).

*Acknowledgments.* We thank Roy Gereau for revising the Latin diagnosis.

Literature Cited

Brewer-Carías, C. (Editor). 1988. Cerro de la Neblina. Resultados de la expedición 1983–1987. Fundación para el Desarrollo de las Ciencias Físicas, Matemáticas y Naturales, Caracas, Venezuela.

Lobreau-Callen, D. 1980. Caractères comparés du pollen des Icacinaceae et des Olacaceae. Adansonia II, 20(1): 29–80.

Sleumer, H. O. 1984. Olacaceae. Flora Neotropica 38. New York Botanical Garden, New York.

# Dos Especies Nuevas del Género *Drosera* (Droseraceae) en Venezuela y Otros Comentarios Taxonómicos

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RESUMEN. Se describen dos especies nuevas del género *Drosera* provenientes de la Guayana Venezolana: *Drosera hirticalyx* y *D. yutajensis*. Las especies *D. colombiana* A. Fernández y *D. panamensis* M. D. Correa & A. S. Taylor son consideradas sinónimos de *D. cayennensis* Sagot ex Diels, mientras que *D. esmeraldae* (Steyermark) Maguire & Wurdack es citada de Colombia y *D. communis* A. Saint-Hilaire es excluida de Venezuela.

ABSTRACT. Two new species of *Drosera* are described from the Venezuelan Guayana: *D. hirticalyx* and *D. yutajensis*. *Drosera colombiana* A. Fernández and *D. panamensis* M. D. Correa & A. S. Taylor are considered conspecific with *D. cayennensis* Sagot ex Diels. *Drosera esmeraldae* (Steyermark) Maguire & Wurdack is reported for Colombia, and the occurrence of *D. communis* A. Saint-Hilaire in Venezuela is disputed.

Se describen dos especies nuevas del género *Drosera* (Droseraceae), las cuales presentan hojas simples estipuladas, y gineceo con 3 estilos bipartidos desde la base, características éstas típicas del subgénero *Drosera* sección *Drosera*.

**Drosera hirticalyx** R. Duno & Culham sp. nov. TIPO: Venezuela. Amazonas: Dpto. Atabapo, Cerro Marahuaca-Huha, cumbre altiplanicie no arbolada, más o menos plana, con piedras expuestas, río abajo, 2580 m, 3°40′N, 65°30′O, 31 ene. 1982, *Steyermark, Guariglia, Holmgren, Luteyn & Mori 125982* (holótipo, NY; isótipo, VEN). Figura 1A–E.

Speciei *Drosera roraimae* affinis, sed foliis brevioribus. Lamina basi gradatim attenuata; petiolus glaber vel subtus pilis raris, unicellularibus, praeditus. Inflorescentia 4–15 cm, (1–)2–6-flora; pedunculus glandulis sessilibus. Semina elliptica, faveolata, 100–150 × 50–100 μm.

Planta herbácea arrosetada. Raíces fibrosas. Tallo corto. Hojas espatuladas, alternas, simples, 5–12 mm de largo; estípulas intrapeciolares, 2–4 mm de largo, 4–6 partidas, soldadas hasta 1.0–1.5 mm de su base; el pecíolo ensanchándose hacia la lámina y poco diferenciado, 4–6 mm de largo, glabro o con escasos pelos simples en el envés; lámina obovada o muy ampliamente obovada, 2.5–5.0 mm de largo y 2.0–4.0 mm de ancho, glabra o con pocos pelos simples en el envés; pelos glandulares (tentáculos) en el centro y margen de la lámina, hasta 2 mm de largo. Escapo 1 ó 2 por planta, 4–15 cm de largo. Inflorescencia monocásica, terminal. Flores (1–)2–6; pedúnculos 4–13 cm de largo, con pubescencia muy variable a lo largo del mismo: en el extremo proximal con glándulas sésiles diminutas, pelos glandulares y a veces glabros o pelos simples, mientras que en el extremo terminal con glándulas sésiles y pelos glandulares; brácteas lanceoladas 2 mm de largo y 1 mm de ancho, con pelos glandulares; pedicelos 0.5–1.0 mm de largo, con pelos glandulares. Sépalos 5, lanceolados, soldados hasta 1.5 mm de su base, 5.0 mm de largo y 2.0–2.2 mm de ancho, acuminados, con pelos glandulares, margen entero. Pétalos 5, espatulados, 6 mm de largo y 2 mm de ancho. Ovario tricarpelar, 1-locular, rudimentos seminales numerosos; estilo 3, bipartido, 2 mm de largo; estigmas como un abanico. Fruto tipo cápsula que se abre por 3 valvas. Semillas faveoladas, elípticas, 100–150 μm de largo y 50–100 μm de ancho, con abundantes granos de cera en la superficie.

*Drosera hirticalyx* está presente en la Guayana Venezolana (Cerro Marahuaca) y crece en afloramientos de arenisca entre 1200 y 2700 m sobre el nivel del mar en lugares húmedos.

*Drosera hirticalyx* es afín a *D. roraimae* (Klotzsch ex Diels) Maguire & J. R. Laundon; esta última especie tiene las hojas más largas (10–20 mm), el pecíolo muy pubescente y claramente diferenciado de la lámina, el número de flores es mayor (4–20), los pelos glandulosos en el cáliz son más pequeños (comparar Fig. 1D y F). Por último la semilla es más larga (400–600 μm)

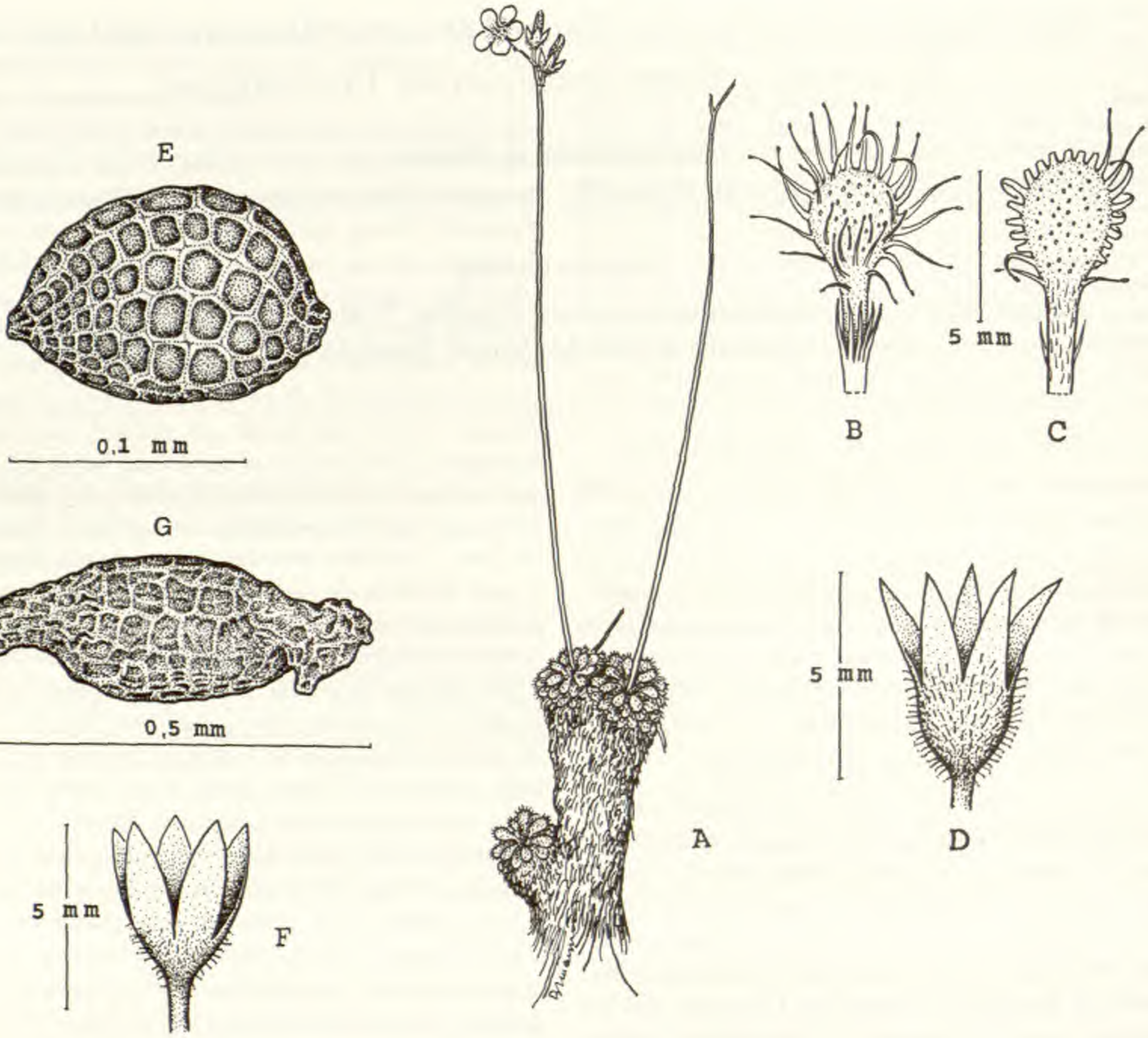


Figura 1. A–E. *Drosera hirticalyx* R. Duno & Culham *Steyermark & Holst 130701* (VEN). —A. Hábito. —B. Hoja cara superior. —C. Hoja cara inferior. —D. Cáliz. —E. Semilla. F, G. *Drosera roraimae* (Klotzsch ex Diels) Maguire & J. R. Laundon (*Liesner 23990*, VEN). —F. Cáliz. —G. Semilla.

y tiene una forma angosto-oblonga con los extremos de la testa inflados (comparar Fig. 1E y G).

*Parátipos.* VENEZUELA. **Amazonas:** Dpto. Atabapo, open rocky plateau of Cerro Marahuaca above Salto Los Monos on tributary of headwaters of río Iguapo, 3°37′N, 65°23′W, 2555 m, near stream, flowers white, 26 Feb. 1985, *Liesner 17998* (MO); Cerro Marahuaca, summit on SE corner, open rocky plateau and ravines, in small pool of water, 3°37′N, 65°21′W, 2700 m, 12 Oct. 1988, *Liesner 24685* (MO); Cerro Marahuaca, summit on SE corner, open rocky plateau and ravines, forming cushions on edge of pond, 3°37′N, 65°21′W, 2700 m, 12 Oct. 1988, *Liesner 24689* (MO); Cerro Marahuaca, summit, SW side of center, open rocky plateau and ravines, on slope, buds pink, 3°39′N, 65°26′W, 2660 m, 24 Oct. 1988, *Liesner 25286* (MO); Cerro Marahuaca, summit on undulating plateau with island of shrubs and *Marahuacaeae* with stream branch leading to Salto de Monos and southeastern edge to Caño Iguapo, S and SE of summit camp, on moist ground, growing with *130700*, leaves dense, short, spreading, 3°37′N, 65°23′W, 2520–2650 m, 26–27 Feb. 1985, *Steyermark & Holst 130701* (MO, VEN); Cerro Marahuaca, summit on undulating plateau with island of shrubs and *Marahuacaeae* with stream branch leading to Salto de Monos and southeastern edge to Caño Iguapo, S and SE of summit camp, petals white, 3°37′N, 65°23′W, 2520–2650 m, 26–27 Feb. 1985, *Steyermark & Holst 130753* (MO, VEN).

**Drosera yutajensis** R. Duno & Culham, sp. nov.

TIPO: Venezuela. Amazonas: Dpto. Atures, valley of río Coro-Coro, W of Serrania de Yutajé, sandstone plateau W of river valley, along trickling stream in slightly depressed area, flowing across exposed sandstone, 1100 m, 5°41′N, 66°09′W, Feb. 1987, *Holst & Liesner 3277* (holótipo, MO; isótipos, RNG, VEN). Figura 2.

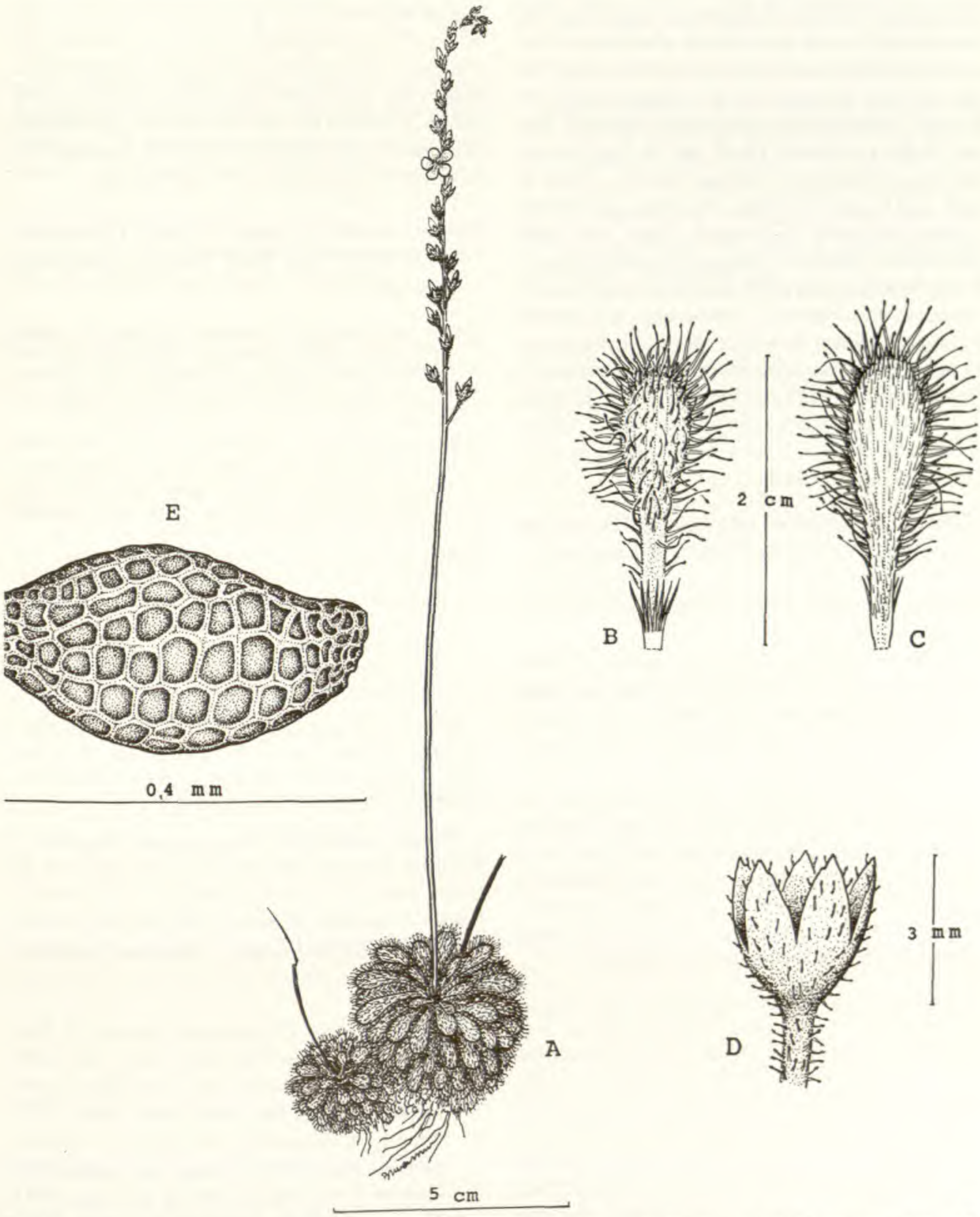


Figura 2. *Drosera yutajensis* R. Duno & Culham (*Huber 12636*, VEN). —A. Hábito. —B. Hoja cara superior. —C. Hoja cara inferior. —D. Cáliz. —E. Semilla.

Speciebus *Drosera villosa* atque *D. arenicola* affinis. Folia lineari-spathulata 10–20 mm, distincte petiolata, petiolis dense pubescentibus. Inflorescentia 20–25 cm, 16–30-flora; pedunculus glandulis raris praeditus. Petala 5, spathulata, 4.5–5 × 2.5 mm; semina faveolata, ovoidea, 400–430 × 230–250 $\mu$m.

Planta herbácea arrosetada. Raíces fibrosas. Tallo corto. Hojas linear-espatuladas, 10–20 mm de largo; estípulas intrapeciolares, 5–6 mm de largo, 5–6 partidas, soldadas hasta 1 mm de su base; pecíolo ensanchándose hacia la lámina pero bien diferenciado, 5–7 mm de largo y 1–2 mm de ancho, pelos simples en el envés; láminas oblanceoladas

u obovadas, 6–12 mm de largo y 2–4 mm de ancho, pelos simples en el envés, pelos glandulares (tentáculos) en centro y margen de la lámina, hasta 4.0 mm de largo. Escapos 1–3 por planta, 20–25 cm de largo. Inflorescencia monocásica, terminal. Flores 16–30; pedúnculo 10–12 cm de largo, erecto con pelos glandulares; brácteas lineares, 2 mm de largo y 0.1 mm de ancho, con pelos glandulares escasos; pedicelos 2–3 mm de largo, con pelos glandulares. Sépalos 5, ovados, 3–5 mm de largo y 1 mm de ancho, con pelos glandulares en el envés, margen entero. Pétalos 5, espatulados, 4.5–5.0 mm de largo y 2.5 mm de ancho. Ovario tricarpelar, 1-locular, rudimentos seminales numerosos; estilos 3, bipartidos, 2 mm de largo; estigmas como un abanico. Fruto tipo cápsula que se abre por 3 valvas. Semillas faveoladas, ovadas, 400–430 $\mu$m de largo y 230–250 $\mu$m de ancho.

*Drosera yutajensis* es sólo conocida de tres colecciones provenientes del cerro Yutajé, en la cuenca del río Manapiare. Crece en afloramientos de arenisca entre 600 y 1800 m sobre el nivel del mar, en lugares húmedos.

*Drosera yutajensis* es afín a *D. villosa* A. Saint-Hilaire (presente sólo en Brasil), ambas con hojas linear-espatuladas, pero más largas en la especie brasilera (2–5 cm), donde además el pecíolo apenas se diferencia de la lámina; la semilla en este último caso es también faveolada pero angostamente oblonga y mucho más larga (600–700 $\mu$m). También es afín a *D. arenicola* Steyermark, las hojas con la misma forma y pubescencia pero más pequeñas en *D. arenicola* (8–12 mm); en esta última el pedúnculo es más corto (1–8 cm), el número de flores menor (1–10) y la semilla es casi elíptica.

*Parátipos.* VENEZUELA. **Amazonas:** Dpto. Atures, Río Coro-Coro, W of Serrania de Yutajé, 8.5 km N of settlement of Yutajé, small tributary, E of river, semi-exposed creek running over igneous fault borded by sandstone, vegetation low, in sandy areas; 650 m, 5°42′N, 66°08′W, 25 Feb. 1987, *Holst & Liesner 3179* (MO); Cumbre del cerro Yutajé, sector oriental de la Serrania Yutajé, herbazal inundable en planicie aluvial, bosquetes de palmas al pie de las vertientes, arbustal y herbazal denso sobre las vertientes rocosas, ocasionalmente en sitios abiertos del arbustal y herbazal, 5°45′N, 66°03′O, 1800 m, 21 mar. 1989, *Huber 12636* (MYF, PMA, VEN).

También fueron estudiadas las especies *D. cayennensis* Sagot ex Diels (1906), *D. colombiana* A. Fernández (1965) y *D. panamensis* M. D. Correa & A. S. Taylor (1976). Estas especies comparten importantes atributos como son: forma, tamaño y pubescencia de las hojas; tipo (pelos simples) y densidad de la pubescencia en el pedúnculo y sépalos; la condición de sépalos libres desde la base y el tipo de dehiscencia de la cápsula. A pesar de que las semillas encontradas en todas las muestras eran inmaduras, presentaban apariencias muy similares. Todas estas similitudes sugieren que nos encontramos en presencia de una sola especie. Previamente Brummer-Dinger (1955) consideró *D. sanariapoana* Steyermark coespecífica a *D. cayennensis.*

*Drosera cayennensis* Sagot ex Diels, Pflanzenfam. 4(112): 86. 1906. TIPO: French Guiana, *Sagot s.n.* (P).

*Drosera sanariapoana* Steyermark, Fieldiana Bot. 28(2): 243. 1952. TIPO: Venezuela. Amazonas: collected on wet savanna, vicinity of Sanariapo, near Río Sanariapo, tributary of Río Orinoco, 100 m, "petal rose," 8 Sep. 1944, *Steyermark 58472* (holótipo, NY).

*Drosera colombiana* A. Fernández, Caldasia 9(43): 226, fig. 1 1965. Sin. nov. TIPO: Colombia. Meta: Llanos de San Martín, en sabana, "pelos finos rojos sobre fonde verde, flores blancas," jul. 1948, *Dryander 3019* (holótipo, COL; isótipo, US).

*Drosera panamensis* M. D. Correa & A. S. Taylor, Ann. Missouri Bot. Gard. 63: 390. 1976. Sin. nov. TIPO: Panamá. La Yeguada, altos de Baltazar y el Veladero, 650 m, 4 ago. 1976, *Correa et al. 2215* (holótipo, PMA; isótipos, CHR no visto, COL, DUKE no visto, F no visto, K, MEXU no visto, MO no visto, NSW no visto, U no visto, US no visto).

*Material adicional estudiado.* GUAYANA FRANCESA: *Leprieuer 145* (parátipo de *D. cayennensis,* M), *Spruce 1068* (parátipo de *D. cayennensis,* M). VENEZUELA. **Amazonas:** *Guanchez 1083* (MO, VEN).

*Drosera esmeraldae* (Steyermark) Maguire & Wurdack fue conocida anteriormente sólo de las tierras bajas de Guayana (Sabana de Esmeralda, Estado Amazonas). Material coleccionado recientemente en Colombia (Vaupés y Amazonas) pertenece a este taxón.

*Drosera esmeraldae* (Steyermark) Maguire & Wurdack, Mem. New York Bot. Gard. 9(3): 335. 1957. *Drosera tenella* var. *esmeraldae* Steyermark, Fieldiana Bot., 28(2): 244. 1952. TIPO: Venezuela. Amazonas: wet places in savanna, between Esmeralda savanna and southeastern base of Cerro Duida, 200 m, 22 Aug. 1944, *Steyermark 60920,* (holótipo, F; isótipo, NY).

*Material adicional estudiado.* COLOMBIA. **Vaupés:** *Schultes 22610* (COL). **Amazonas:** *Idrobo 8970* (COL), *Sastre & Reichel 5209* (COL). VENEZUELA. **Amazonas:** *Clark 6475* (NY), *Holst & Liesner 3275* (MO), *Liesner & Holst 21800* (MO), *Huber 2697* (MO), *Maguire et al. 29616* (BM, FM, NY), *Stergios & Aymard 4277* (PORT).

En relación con *Drosera communis* A. Saint-Hilaire, Maguire & Wurdack (1957) indican la presencia de esta especie para Venezuela; sin embargo no incluyen lista de exsiccatas. Los pocos especí-

menes recolectados posteriormente en Venezuela e identificados por J. A. Steyermark: (*Kral 72009* (VEN), *Steyermark 128551* (MO, VEN) y *Steyermark 128978-A* (MO, VEN)) difieren claramente del material tipo de esta especie: *Saint-Hilaire 695* (holótipo, P); estas muestras fueron identificadas como *D. roraimae* (Klotzsch ex Diels) Maguire & J. R. Laundon. Por lo tanto consideramos que esta especie no está presente en Venezuela ni Colombia y su área de distribución queda limitada al hemisferio Sur (Brasil meridional y Uruguay).

*Drosera communis* A. Saint-Hilaire, Pl. Usual. Bras. XV plate 15. 1824. TIPO: Brasil. Minas Gerais: *Saint Hilaire 695* (holótipo, P).

*Drosera parvifolia* A. Saint-Hilaire, Hist. Pl. Remarq. Brésil, p. 263, t. 25. 1824. TIPO: Brasil. Minas Gerais: *Saint Hilaire D377* (holótipo, P).

*Drosera communis* var. *pauciflora* Eichler en Martius, Fl. Bras., 14: 394. 1872. TIPO: B.

*Material adicional estudiado.* BRASIL. **Minas Gerais:** *Glaziou 10258* (P). **Rio de Janeiro:** *Glaziou 14483* (P). **São Paulo:** *Saint Hilaire D 722* (P), *Gardner 3573* (K), *Luetzelburg 21485* (M), *Luetzelburg 21509* (M). PARAGUAY: *Hassler 5271* (K, P), *Hassler 5634* (K, P).

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Literatura Citada

Brummer-Dinger, C. H. 1955. Notes on Guiana Droseraceae. Acta Bot. Neerl. 4(1): 136–138.

Correa, M. D. & A. S. Taylor B. 1976. Droseraceae. Ann. Missouri Bot. Gard. 63: 389–392.

Diels, L. 1906. Droseraceae. *En:* Engler, Das Pflanzenreich 26 (4): 1–136.

Fernández-Pérez, A. 1965. Plantas Insectívoras, II Droseraceae de Colombia. Caldasia 11(43): 219–232.

Maguire, B. & J. J. Wurdack. 1957. The Botany of the Guayana Highland—Part II. Mem. New York Bot. Gard. 9(3): 331–336.

# *Palisota flagelliflora* (Commelinaceae), a New Species from Cameroon with a Unique Habit

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ABSTRACT. *Palisota flagelliflora* Faden (Commelinaceae), a rosette species, is unique in *Palisota* in bearing its inflorescences on axillary, flagelliform shoots that lie on the forest floor. These shoots continue to grow sympodially and give rise to additional inflorescences or viviparously produce a new rosette. Other rare or unique features include: inflorescences composed of single cincinni, long pedicels, often vertical flowers, yellow staminode filament hairs, bearded filament and connective in the unpaired stamen, and bearded style.

The genus *Palisota* Reichenbach f. ex Endlicher, with ca. 18 species (Faden & Hunt, 1991), is the largest African genus of Commelinaceae occurring predominantly in forests (Faden, 1983). Its center of diversity is Central Africa, especially Cameroon and Gabon. Until recently, all described species were either acaulescent rosette plants or herbaceous shrubs, and all had terminal or terminal and axillary, thyrsiform inflorescences. Recently described species (Brenan, 1984) have habits and inflorescences that depart from these types, including a decumbent habit and strictly axillary inflorescences. A unique habit, rosettes producing flagelliform flowering shoots, is described below in the new species *P. flagelliflora*.

**Palisota flagelliflora** Faden, sp. nov. TYPE: Cameroon. South Prov. [South-Central Prov.]: Kribi-Lolodorf road 3.5 km along the road to Edéa that branches off to the N at km 18 (just past Bissiang), 200 m on a track that branches off the Bissiang-Edéa road, 3°02′N, 10°02′E, exploited forest with much of the structure and understory vegetation remaining, nearby pure stand of *Cecropia* (*Musanga*) *cecropioides* along the Bissiang-Edéa road, 29 Jan. 1986, *Faden & Mbamba 86/50* (holotype, US sheet no. 3264040; isotypes, B, BR, C, COI, G, GC, HBG, IEC, K(3), LISC, MA, MO, P, S, UPS, US(4), WAG, YA(2)). Field-collected inflorescences and fruits, preserved in FAA (US vial B470), are part of the type collection. Figures 1, 2.

Herbae perennes foliis rosulatis, 14–50 cm longis, 3.5–10(–11) cm latis, lamina elliptica vel oblongo-elliptica ad oblanceolatam vel obovatam, 10–40 cm longa; inflorescentiis terminalibus et bracteas oppositis in surculis axillaribus, flagelliformibus (1.5–)25–100(–175) cm longis, cincinnis solitariis et contractis, bracteis binatis subtentis compositis; floribus bisexualibus et masculis, stamine impari apice filamenti et in connectivo barbato, sacculo antherae in flore bisexuali indehiscenti, in flore masculo dehiscenti, ovulis biseriatis; fructibus triangulari-ellipsoideis ad triangulari-ovoideos, apice acuto ad rostratum, 1.4–2.3 cm longis, 0.9–1.2 cm latis, coccineis vel rubiginosis, dense pilosis; seminibus uni- vel biseriatis.

Perennial with a rhizome to 15 cm long, frequently producing offsets, leaves all or mainly in rosettes, petiolate, 14–50 cm long, 3.5–10(–11) cm wide, petiole 4–19 cm long, appressed pubescent, lamina elliptic or oblong-elliptic to oblanceolate or obovate, 10–40 cm long, apex abruptly acute or acuminate, base cuneate to attenuate, surfaces discolorous, adaxial green, glabrous or appressed whitish sericeous and glabrescent (this pubescence ± persistent in cultivation), abaxial persistently appressed whitish sericeous. Inflorescences terminal, usually becoming bract-opposed, pedunculate, borne on axillary, leafless, bracteate, flagelliform shoots (1.5–)25–100(–175) cm long, at first ascending, soon becoming prostrate and creeping through the leaf litter, rarely obviously branched, rarely rooting, many-noded, extending sympodially from the axil of the bract subtending the peduncle, the flagelliform shoot in this manner often producing a succession of terminal/bract-opposed inflorescences, often viviparously producing a new rosette distally; internodes appressed sericeous, nodes covered by persistent maroon bracts 1.5–4 cm long, appressed whitish sericeous; peduncle 1–8.5 cm long, usually appressed sericeous, sometimes densely lanate; each inflorescence consisting of a single contracted, several-flowered cincinnus subtended by a pair of maroon bracts 1.5–2.5 cm long, similar in shape, color, and pubescence to those of the flagelliform shoot. Flowers bisexual and male, predominantly vertical or with the unpaired (outer) sepal uppermost, occasionally horizontal, ca. 15–18 mm wide, odorless; pedicels erect in flower, be-

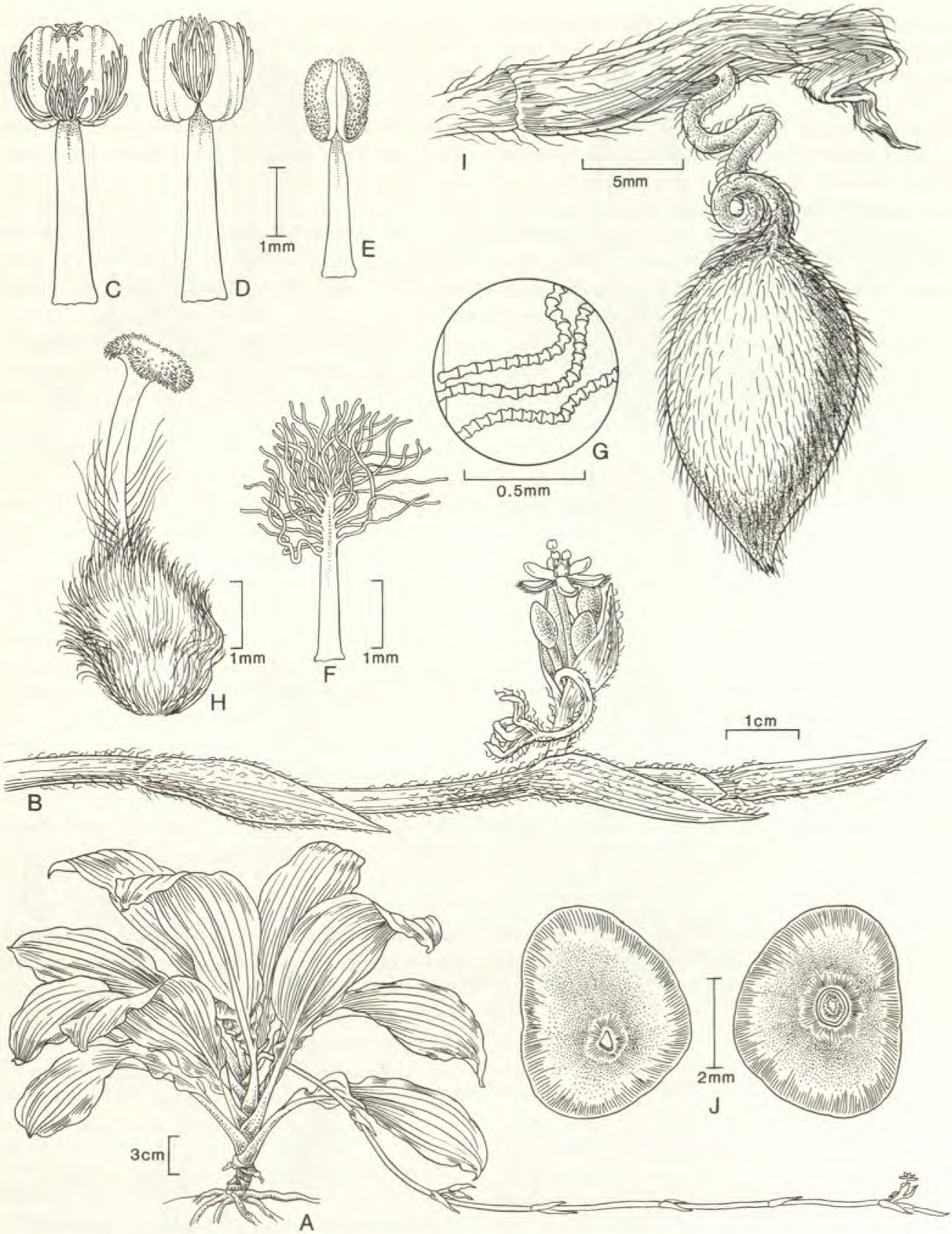


Figure 1. *Palisota flagelliflora* Faden. —A. Habit, showing flagelliform flowering shoot. —B. Inflorescence terminal on flagelliform flowering shoot, the shoot growth continuing sympodially from the axil of the bract at the base of the peduncle. —C. Unpaired stamen, bisexual flower, ventral view. —D. Unpaired stamen, bisexual flower, dorsal view. —E. Paired stamen, dorsal view. —F. Paired staminode. —G. Staminode filament hairs. —H. Gynoecium, lateral view. —I. Fruit, showing contorted pedicel. —J. Seeds, dorsal and ventral views. All from *Faden & Mbamba 86/50.*

Figure 2. *Palisota flagelliflora* Faden. —A. Male flower, front view. —B. Male flower, side view. —C. Bisexual flower, front view. —D. Bisexual flower, side view. All from *Faden & Mbamba 86/50.*

coming spirally contorted in fruit, 1.5–3.5 cm long, white, sometimes tinged with reddish purple, pilose; sepals subequal, boat-shaped, lanceolate-oblong to oblong-elliptic, (3–)6–7.5 mm long, 2–3 mm wide, reddish purple outside, the color shining through, densely hirsute with reddish hairs forming an apical tuft, usually intermixed with finer, shorter, white hairs; petals subequal, outer slightly broader than the others, elliptic, (4–)6 mm long, (2–)3–3.5 mm wide, white, inner petals oblong to spathulate-

oblong, (4–)6.5–7 mm long, (1.5–)2–2.5 mm wide, usually white, sometimes maroon with white margins; unpaired staminode lacking or with a filament 1.5–2 mm long and bearded subapically with apparently moniliform, white-based yellow hairs; paired staminodes with filaments 2–3 mm long, white, bearded in the distal half with hairs like those of the outer staminode; paired stamens with filaments (2–)3–3.5 mm long, glabrous, white, anthers broadly elliptic to oblong-elliptic or ovate-elliptic, (1–)1.5–1.75 mm long, 0.7–1 mm wide, dehiscence extrorse, connective yellow, glabrous, pollen yellow; unpaired stamen dimorphic, in bisexual flower slightly shorter to slightly longer than the paired stamens, filament (1.5–)2.5–3.5 mm long, strongly declinate, white, usually densely bearded with minute yellow hairs just below the anther, anther broadly ovoid, ca. (1–)1.8 mm long and wide, yellow, pollen sacs C-shaped, indehiscent, connective usually densely bearded with minute yellow hairs; in male flower unpaired stamen distinctly longer than the paired, more central in the flower, usually not declinate, filament ca. 5 mm long, white, bearded at apex, as in bisexual flower, anther similar to that of bisexual flower, including densely bearded connective, but smaller (ca. 1.4 mm long and wide) and pollen sacs dehiscent, introrse, with pollen concolorous with that of the paired stamens; gynoecium reduced and apparently abortive in the male flower, in the bisexual: ovary ovoid, deeply 3-lobed, ca. 2–2.5 mm long, densely pubescent with forward-directed, white or reddish hairs, locules 5–7-ovulate, ovules biseriate, style exceeding the stamens, 3.2–4 mm long, straight or declinate, yellow, sparsely bearded basally with appressed hairs like those of the ovary, stigma deeply 3-lobed, yellow with a central brownish area. Fruits triangular-ellipsoid to triangular-ovoid berries, acute to beaked at the apex, 1.4–2.3 cm long, 0.9–1.2 cm wide, scarlet or reddish brown, densely reddish pilose. Seeds uni- or biseriate, 1–4 per locule, ovate-triangular in outline, ca. 4–5 mm diam.

*Habitat.* Secondary and exploited forest, 10–520 m.

*Flowering.* January, February, July, September. In cultivation the flowers open at about 0940 and begin to fade at 1230–1330.

*Distribution.* Endemic to Cameroon.

*Palisota flagelliflora* is unique in *Palisota* because of its flagelliform shoots, bract-opposed inflorescences, and vivipary. It may further be distinguished by its inflorescences composed of a single cincinnus, long pedicels, large, often vertical flowers, yellow staminode filament hairs, bearded stamen filament and connective in the unpaired stamen, and bearded style. It also has the earliest flower opening time for any *Palisota* species thus far recorded or observed.

In the above description the dimensions of the floral parts were measured from preserved flowers of a cultivated plant of *Faden & Mbamba 86/50.* The much smaller dimensions for some parts, listed parenthetically, came from a pressed flower on a small plant of *Leeuwenberg 8296* (WAG). No field-preserved flowers were available. The larger flowers were the largest observed in *Palisota.*

The staminode filament hairs were described above as "apparently moniliform" because of the beadlike appearance of the cells at low magnification. However, higher magnification (Fig. 1G) revealed that the cells of the hairs were individually dumbbell-shaped, not spherical or ellipsoid, as in typical moniliform hairs.

The nature of the flagelliform shoots requires some comment. Morphologically they could be considered one of the following: long, axillary inflorescences; axillary shoots bearing terminal inflorescences; inflorescence-shoots; or stolons bearing inflorescences. Their actual structure is clear, so the problem is more semantic than morphological. Forman (1962) tried to distinguish between an axillary inflorescence and a reduced axillary shoot bearing a terminal inflorescence, which he termed an inflorescence-shoot. Faden (1991: 11) found the difference between the two, which was based on the absence (inflorescence) or presence (inflorescence-shoot) of a basal prophyll, not very useful because the whole range from leafy lateral shoots with a terminal inflorescence to reduced lateral shoots with only bracts (inflorescence-shoot) could be found within a single plant in some *Aneilema* species. The axillary inflorescence might have evolved by further reduction, namely loss of the prophyll.

Many forest Commelinaceae produce stolons: axillary, elongate, horizontal shoots with only leaf sheaths basally (Faden, 1988). Distally stolons produce new vegetative shoots, not inflorescences. The inflorescence-terminated shoots of *Palisota flagelliflora* are dissimilar because they bear only bracts and they are primarily for sexual, not vegetative, reproduction. When they viviparously produce a new plant, they are more like the reproductive shoots of the epiphytic *Belosynapsis vivipara* (Dalzell) C. E. C. Fischer than like stolons of other terrestrial species. Because they are unique in *Palisota,* and perhaps within the family, I have used the term "flagelliform shoots" to describe them.

The regularly biseriate ovules were a surprising find in view of the fact that the seeds may be uni-

seriate. The alignment of the seeds in the fruit seems to be a function, at least partly, of seed number per locule. When three or fewer the seeds appear uniseriate, when four or more, biseriate. Only two fruits were available for dissection, so which of these arrangements predominates and whether more seeds are ever present is unknown.

One of the two sheets of *Leeuwenberg 8296* (WAG) bears two small plants each with a short inflorescence (only 1.5 cm long in one case). Had these been the sole plants collected, treating them as *Palisota flagelliflora* would have had to have been based largely on the very long pedicels and bearded connective of the unpaired stamen. The second sheet, as well as specimens of this collection seen elsewhere, clearly demonstrate that the small plants are merely young *P. flagelliflora* with short inflorescences.

*Faden & Mbamba 86/47* was noted in the field as differing from *Faden & Mbamba 86/50* in not forming dense stands, in being sterile (it had produced new rosettes at the ends of axillary, flagelliform shoots), less robust, with a reddish petiole and smaller, less discolorous lamina more abruptly narrowed into the petiole, and with smaller bracts on the flagelliform shoots. Although exact chromosome counts were not obtained from either population, $2n$ = ca. 40 (approximately diploid) was counted for *Faden & Mbamba 86/47* and $2n$ = ca. 60 for *Faden & Mbamba 86/50* (approximately triploid). *Faden & Mbamba 86/50* was selected as the type, despite its being possibly triploid, because abundant reproductive material was present in the field, including ripe fruits and buds, and that population also flowered in cultivation, whereas *Faden & Mbamba 86/47* did not flower before it died.

The inclusion of *Bos 3877* in *Palisota flagelliflora* was questionable. Although it came from very close to the type locality, it differed most obviously from the other collections by its broader leaves, more robust flowering shoots that perhaps were not lying in the leaf litter, peduncles completely covered by lanate, brownish hairs, and by lacking sterile bracts between the bracts at the bases of the peduncles. Dissection of flower buds, nearly all partly eaten or bored, revealed that all three stamen filaments and connectives were glabrous, differing from all other collections of *P. flagelliflora*. In the absence of a larger number of collections, *Bos 3877* is provisionally included in *P. flagelliflora*.

*Bos 3877* approached *Palisota lagopus* Mildbraed in robustness and peduncle pubescence, differing most obviously by its longer, axillary, sympodial flowering shoot with several inflorescences and longer, spirally contorted fruiting pedicels. Its somewhat intermediacy between this species and *P. flagelliflora* suggested a possible hybrid origin, but it could just as readily represent an undescribed species or a form of *P. flagelliflora*.

*Palisota flagelliflora* is an understory species that has been collected in secondary and exploited primary forest. It should also occur in undisturbed primary forest. In Littoral Province the primary vegetation at the locality for this species would be "Atlantic forest of the northwestern type with Caesalpiniaceae rare" (Letouzey, 1985). At the localities east of Kribi the primary forest type would be "Atlantic littoral forest with Caesalpiniaceae relatively rare, with *Saccoglottis gabonensis*" (Letouzey, 1985).

In the field *Palisota flagelliflora* may form dense stands because of its ability to reproduce vegetatively. That tendency, along with the small size of the rosettes, compared to other species, allows it to be spotted from a distance. Closer up, the flagelliform shoots and vivipary are very distinctive, as is the presence of hairs on the connective and filament apex of the unpaired stamen.

*Palisota flagelliflora* appears related to the red-fruited species of *Palisota* because of its fruit color, hairy fruits (glabrous in some species), persistent faded flowers, and long, spirally contorted fruiting pedicels. Most of those species, such as *P. barteri* Hooker and *P. mannii* C. B. Clarke, have uniseriate seeds and would thereby belong to section *Monostichos* C. B. Clarke. *Palisota flagelliflora*, however, with its biseriate ovules and sometimes biseriate seeds, would have to be placed in section *Palisota* (synonym: section *Distichos* C. B. Clarke, 1881: 133) with the blue- and black-fruited species such as *P. ambigua* (P. Beauvois) C. B. Clarke and *P. hirsuta* (Thunberg) K. Schumann. This apparent anomaly may be explained either by Clarke's sections being unnatural, which well may be the case, or by seed arrangement not always reflecting ovule arrangement, about which we have insufficient data.

*Palisota flagelliflora* is probably most closely related to *P. satabiei* Brenan and *P. bogneri* Brenan, small, red-fruited species with axillary inflorescences, biseriate ovules, and, like *P. flagelliflora*, a restricted distribution in the species-rich coastal forests of Cameroon and Gabon. *Palisota flagelliflora* uniquely shares with *P. satabiei* the features of the inflorescence consisting of a single cincinnus, yellow staminode filament hairs, bearded anther connective, and bearded style. Preserved fruits of *P. satabiei* (*Satabié & Letouzey 384*, YA) showed partly biseriate seeds in one locule, as in *P. flagelliflora*.

*Palisota flagelliflora*, *P. satabiei*, and *P. bogneri* extend the range of habit and inflorescence types previously known in *Palisota*: decumbent habit (*P. satabiei*), vivipary, strictly axillary inflorescences, inflorescences composed of single cincinni, and flagelliform flowering shoots. My research on the Commelinaceae of Cameroon has revealed additional habit types in the genus: scandent (to 15 m in length) in *P. thollonii* Hua, and decumbent with a terminal thyrse in an undescribed species from Cameroon and Gabon. The diversity of habit types now known within *Palisota* rivals that in the much larger neotropical genus *Dichorisandra*, which is the ecological counterpart of *Palisota* in South America.

It should be noted that the bisexual flower depicted in Figure 2 has the lower (unpaired) stamen longer and less declinate than in the most extreme cases. Insufficient flowers have been examined to generalize about the "typical" curvature and length of the filament.

*Paratypes.* CAMEROON. **Littoral Prov.:** Forêt du Bukaka, 3 km E of Ebené, a village on km 11 Nkongsamba–Loum road, 4°50′N, 9°54′E, alt. 520 m, 8 Sep. 1971, *Leeuwenberg 8296* (US, WAG—2 sheets,YA). **South Prov.:** ca. 18 km from Kribi, Lolodorf road, 3°00′N, 10°02′E, 5 Feb. 1969, *Bos 3877* (WAG, YA); 4 km N of km 20 Kribi-Lolodorf, 3°02′N, 10°03′E, 4 July 1970, *Bos 7014* (US, WAG—3 sheets, YA); Kribi-Lolodorf road, km 20, end of track ca. 2 km N of the road, ca. 3°01′N, 10°03′E, alt. 10 m, 29 Jan. 1986, *Faden & Mbamba 86/47* (P, US, YA).

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Literature Cited

Brenan, J. P. M. 1984. Two new species of *Palisota* (Commelinaceae) from West Africa. Kew Bull. 39: 829–832.

Clarke, C. B. 1881. Commelinaceae. Pp. 113–324 *in* A. & C. de Candolle, Monographiae Phanerogamarum 3. Sumptibus G. Masson, Paris.

Faden, R. B. 1983. Phytogeography of African Commelinaceae. Bothalia 14: 553–557.

———. 1988. Vegetative and reproductive features of forest and nonforest genera of African Commelinaceae. Pp. 521–526 *in:* P. Goldblatt & P. P. Lowry II (editors), Modern Systematic Studies in African Botany. Monogr. Syst. Bot. Missouri Bot. Gard. 25.

———. 1991. The morphology and taxonomy of *Aneilema* R. Brown (Commelinaceae). Smithsonian Contr. Bot. 76: 1–166.

——— & D. R. Hunt. 1991. The classification of the Commelinaceae. Taxon 40: 19–31.

Forman, L. L. 1962. *Aëtheolirion*, a new genus of Commelinaceae from Thailand, with notes on allied genera. Kew Bull. 16: 209–221.

Letouzey, R. 1985. Notice de la carte phytogéographique du Cameroun: 1:500,000. Institut de la Recherche Agronomique (Herbier National), Yaoundé, and Institut de la Carte Internationale de la Végétation, Toulouse.

# Typification of *Pinus apulcensis* Lindley (Pinaceae), a Misinterpreted Name for a Latin American Pine

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ABSTRACT. The Mexican taxon *Pinus apulcensis* Lindley is lectotypified with an ovuliferous cone found among carpological material in the herbarium of the Natural History Museum in Vienna (W), which was sent to Endlicher by Lindley. This cone confirms treatments of that name in publications on Mexican pines up to 1945–1948, when Martínez interpreted it in a different sense, using a specimen he had received from the putative type locality. The resulting confusion has been corrected, and a revised synonymy of Lindley's taxon is presented.

During work being carried out to complete the monographic study of pines for *Flora Neotropica* started by Brian T. Styles, a problem was encountered regarding the current interpretation of one of John Lindley's species from Mexico, *Pinus apulcensis*. This interpretation, commonly accepted since Martínez (1945, 1948), and followed by Stead & Styles (1984) in their revision of the "*pseudostrobus*" group, was due to the lack of a type specimen, and was based on what may be described as the topotype method: the assumption that whatever pine grows today at the type locality must be Lindley's taxon.

Lindley (1839) published two new species of pine based on collections made by C. T. Hartweg in Mexico in 1838: *Pinus pseudostrobus* from Angangueo ("Anganguco," Michoacán) and *P. apulcensis* from "ravines near Apulco" (Hidalgo). (The confusion of Apulco with Acapulco seems to have originated with Endlicher (1847: 154).) The original descriptions of both are concise. Apart from short leaves and glaucous shoots, *P. apulcensis* is said to differ from *P. pseudostrobus* mainly in its cones, "covered closely with pyramidal elevations, which are sometimes prolonged and contracted in the middle, especially those near the points of the cones."

Lindley's herbarium is largely at CGE; a few types are also at BM and K (Stafleu & Cowan, 1981). A catalog of conifers (Dümmer, 1913) lists what was in the Lindley herbarium (CGE) early in the twentieth century. Neither of the two taxa with which we are concerned here is mentioned in that catalog. Searches for original material of *Pinus apulcensis* in the above-mentioned herbaria were unsuccessful (Stead & Styles, 1984).

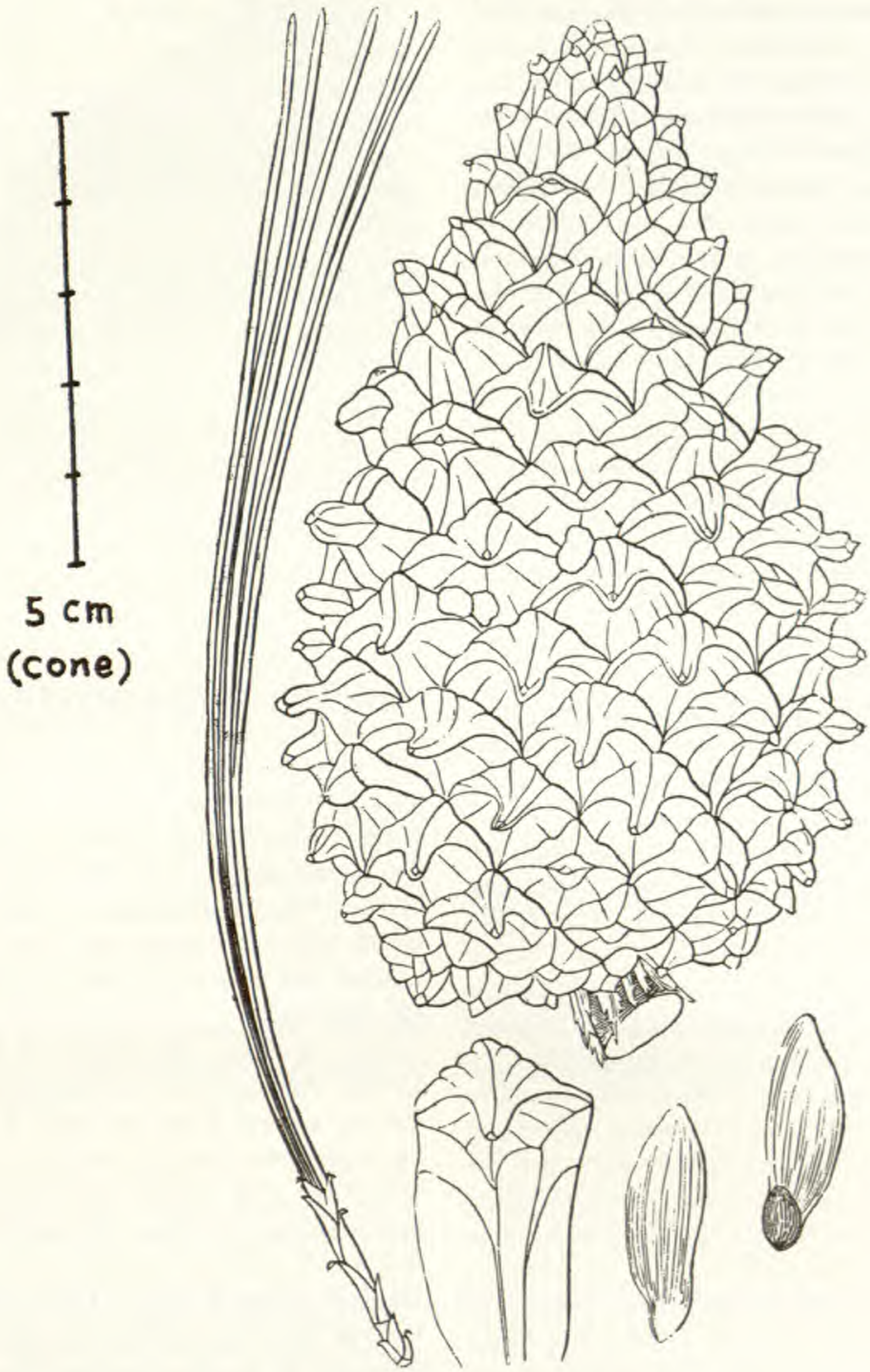
Loudon (1842: 1014–1015) translated Lindley's diagnosis and repeated his English description of *Pinus apulcensis* but stressed even more the "backs of the scales. . .sometimes prolonged into a hook, particularly those nearest the base and the point." He stated that the species was introduced in 1839, "by cones sent home by Hartweg, from which many plants have been raised." And finally, he presented figures 1899 and 1900, "from specimens sent home by Hartweg." Figure 1899 is a natural-size (12 cm long) line drawing of a closed (green?) cone clearly showing what is meant by "prolonged and contracted pyramidal elevations" (Lindley, 1839) and "scales prolonged into a hook" (Loudon, 1842). There can be little doubt that this drawing represents both Hartweg's original collection and Lindley's *P. apulcensis* (Fig. 1).

Shaw (1909) reduced *Pinus apulcensis* Lindley to *P. pseudostrobus* var. *apulcensis*, citing the basionym, Loudon's (1842) figure 1899, Endlicher (1847: 153), and three Mexican collections: *Nelson 985* (US) and *Nelson 2539* (US), both from Oaxaca, and *Pringle 8788* (MEXU, US) from Mexico, as his references. In his plate 12, figures 8, 7, and 6 represent cones of these collections respectively. Like Lindley and Loudon, Shaw emphasized the "peculiar development of the apophyses of the cone, which may attain remarkable prominence." These three collections present considerable variation in development of the apophysis, with *Nelson 2539* closely resembling figure 1899 in Loudon (1842), and *Nelson 985* attaining much longer apophysal elongations and very strongly developed umbos. The present study, based on many more collections, demonstrates that *Nelson 2539* and *Nelson 985* represent the two extremes of a cline in these characters. *Pringle 8788* has strongly developed umbos, but the apophyses of the scales are flat and the

1014 ARBORETUM ET FRUTICETUM BRITANNICUM.

† 48. *P.* APULCE'NSIS *Lindl.* The Apulco Pine.

*Identification.* Lindl. in Bot. Reg. M. Chron., 1839, No. 100.
*Synonyme.* *P.* acapulcénsis *G. Don* in *Sweet's Hort. Brit.* ed. 3. p. 769.
*Engravings.* Our *figs.* 1899, 1900. from specimens sent home by Hartweg.




1899. *P.* apulcénsis.

Figure 1. Illustration of *Pinus apulcensis* Lindley (Fig. 1899) in Loudon's *An Encyclopaedia of Trees and Shrubs; Being the Arboretum et Fruticetum Abridged* (1842); drawn "from specimens sent home by Hartweg."

scales rather thin, which places it outside this cline.

Martínez (1945: 192; see also 1948: 199) refuted Shaw's inclusion of the two Nelson cones, in the belief that the specimens from Oaxaca were not conspecific with those from Apulco: "The specimens from Apulco and surrounding areas lack the characteristic elongations seen in specimens found further south, that is, in Veracruz and Oaxaca" [translated from Spanish]. He observed that Lindley

did not mention these elongations ("prolongaciones," meaning the elongated apophyses) but only "a recurved tip," which sounds like an attempt to bend Lindley's description into shape with what Martínez saw from Apulco. His subsequent "new" combination *Pinus pseudostrobus* Lindley var. *apulcensis* Martínez is superfluous because it repeats Shaw (1909) by including Lindley's type, the identity of which was totally unknown to Martínez. The specimens he referred to (e.g., *Martínez 3434* from Apulco, Hidalgo "var. nov." MEXU; Martínez, 1948: 201, f. 162) indeed lack any pronounced elongation of apophyses and/or umbos. However, they do not represent Lindley's species, but Martínez's interpretation of it, based on the cited locality. Collected around 1939, almost exactly a century after Hartweg made his collections, they are not necessarily from the same location. North of the city of Tulancingo there are two localities with the name Apulco, one at the railwayhead and another ca. 4 km further down a road. To the east of these are mountains (Cerro Viego) and streams (canyons) with pine forests. This constitutes a large area, and it is impossible to know exactly where Hartweg made his collection.

Given the depletion of pine forests in many parts of Mexico in the last 100 years, it may well be that the trees Hartweg saw and collected are no longer there.

For the collections from Oaxaca that Shaw had cited under *Pinus pseudostrobus* var. *apulcensis* (*Nelson 985* and *Nelson 2359*), Martínez (1945: 195; see also 1948: 202) proposed a new combination, *P. pseudostrobus* var. *oaxacana*, citing in synonymy *P. pseudostrobus* var. *apulcensis* (Lindley) Shaw. This was an error: he clearly meant to exclude Lindley's type (Mirov, 1958) and to describe a new variety based on the two Nelson collections. Further, the name was not validly published because he failed to provide a Latin diagnosis. Mirov (1958), referring to the specimens cited by Shaw (1909) and the description given by Martínez (1945), and excluding *P. apulcensis* Lindley, described it as a new species: *P. oaxacana* Mirov. Harrison (1965) then validated Martínez's earlier combination under *P. pseudostrobus* at the rank of variety.

Martínez, in the absence of Lindley's type and with no easy access to European herbaria or nineteenth-century botanical literature (he studied these pines during the Second World War), relied on the topotype method to establish the identity of *Pinus apulcensis* Lindley. Understandable as this may be in the case of Martínez, given the circumstances under which he worked, it is remarkable that later authors (Loock, 1950; Mirov, 1958; Harrison, 1965; Stead, 1983; Stead & Styles, 1984) simply accepted his judgment and never pursued the identity of Lindley's name by typification.

Stead (1983) undertook a numerical study of variation in which one of his collecting sites (No. 14) was the putative type locality of *Pinus apulcensis* Lindley at Apulco, Hidalgo. In his Principal Component Analysis (PCA), the Apulco material (from 25 trees) groups with sites 13 (*P. pseudostrobus* var. *estevezii* Martínez) and 15 (*P. pseudostrobus* var. *coatepecensis* Martínez) on character states such as "increasing cone size, needle width and stomatal lines," but without any clear discontinuity. Cone size also increased for site 8 (representing *P. pseudostrobus* var. *oaxacana* (Mirov) Harrison), but no other characters, including its "very distinctive cones" would separate out this taxon.

The conclusions outlined in Stead (1983) were adopted by Stead & Styles (1984), who identified the material from sites 13–15 as *Pinus pseudostrobus* subsp. *apulcensis* (Lindley) Stead. The two varieties of Martínez (from sites 13 and 15) were cited as synonyms, as well as *P. pseudostrobus* var. *apulcensis* "sensu Shaw pro parte" (which, as can be understood from the synonymy under the previous taxon treated in their revision, means as to type, not to specimens cited). The type, however, was cited as "Apulco, *Hartweg s.n.* (not seen)." (Lindley (1839) did not indicate any lack of a collection number and only mentioned that it was "found by Mr. Hartweg").

It is, of course, the identity of *Pinus apulcensis* Lindley that needs to be established before adopting this epithet. From the above it is obvious that an ovuliferous cone is needed; there is general agreement that foliage characters within *Pinus pseudostrobus* s.l. show considerable overlap and that leaves alone are inadequate for certain determination (Stead & Styles, 1984; Perry, 1991; Carvajal & McVaugh, 1992). Lindley, when he was Secretary of the Horticultural Society of London, distributed material collected by Hartweg to various botanists in Europe, among whom were Parlatore in Florence and Endlicher in Vienna. On a recent visit to Vienna (W), a number of conifer cones of Hartweg's gatherings were found. Among them are two cones of a Mexican pine with Lindley's labels: "*P. apulcensis* Lindley" and a vial with seeds and scales. The cones are 9.5 × 6 cm (closed) and 10 × 8 cm (open) and strongly resemble figure 1899 in Loudon (1842). They are original material and

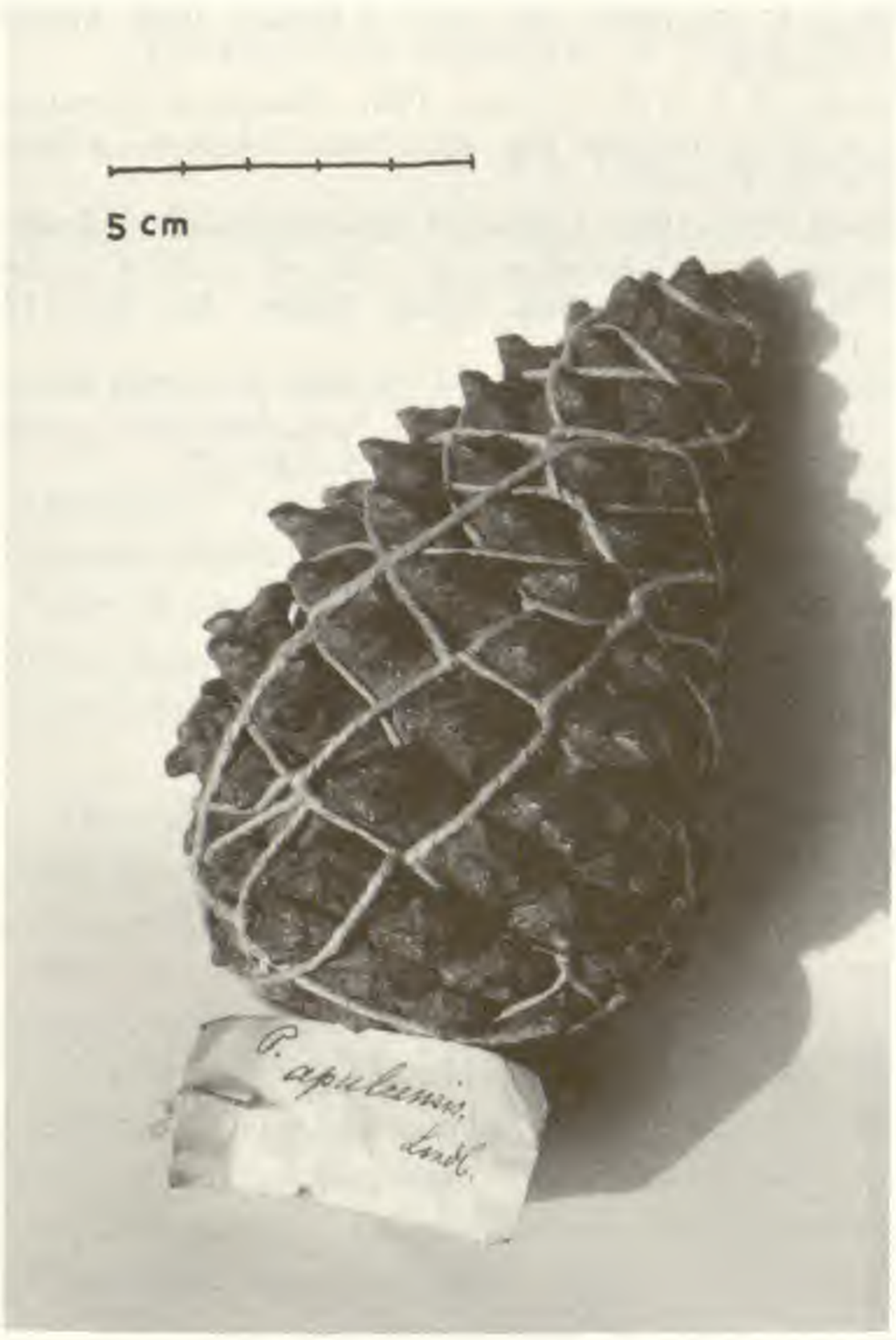



Figure 2. Closed ovuliferous cone of *Pinus apulcensis* Lindley, with a label written by John Lindley; it is part of the lectotype in the carpological collection of the Natural History Museum in Vienna (W).

are here designated as the lectotype of *Pinus apulcensis* Lindley (Fig. 2).

The synonymy given here pertains only to *Pinus apulcensis* Lindley; no full synonymy is given for *P. pseudostrobus* Lindley.

**Pinus pseudostrobus** Lindley var. **apulcensis** (Lindley) Shaw, Publ. Arnold Arbor. 1: 19, t. 12, f. 6–8. 1909. *Pinus apulcensis* Lindley, Edwards's Bot. Reg. 25: 63. Aug. 1839 [& Allg. Gartenzeitung 7: 325. 1839]. *Pinus pseudostrobus* subsp. *apulcensis* (Lindley) Stead, Bot. J. Linn. Soc. 89: 269. 1984. TYPE: Mexico. Hidalgo: ravines near Apulco, *C. T. Hartweg s.n.*, ex Hort. Soc. London, 2 ovuliferous cones with labels: *P. apulcensis* Lindley in Lindley's handwriting, vial with seeds and scales (lectotype, here designated, W).

*Pinus pseudostrobus* var. *oaxacana* Martínez, Anales Inst. Biol. Univ. Nac. México 16: 1945, f. 164–168. 1945, nom. inval.

*Pinus oaxacana* Mirov, Madroño 14: 145. 1958. *Pinus pseudostrobus* var. *oaxacana* (Mirov) S. G. Harrison, Taxon 14: 247. 1965. TYPE: Mexico. Oaxaca: La Parada, *E. W. Nelson 985* (holotype, US).

*Pinus pseudostrobus* Lindley is a widely distributed species with polymorphic ovuliferous cones, occurring from Sinaloa and Nuevo León in Mexico to Honduras (Stead & Styles, 1984). *Pinus pseudostrobus* var. *apulcensis* (Lindley) Shaw is a cone variant distinguished by more or less clinal characters becoming more abundant in southern Mexico. It is usually sympatric with *P. pseudostrobus* Lindley var. *pseudostrobus* but apparently absent from large parts of the range of the species (Carvajal & McVaugh, 1992). Acceptance at any other rank than variety therefore seems unwarranted for this taxon. Current use of the epithet *apulcensis* in the sense of Article 57 (formerly 69.4) of the *Code* (Greuter et al., 1994) is only at infraspecific rank. The name *P. oaxacana* is occasionally used, but this taxon, too, is treated in most of the literature, especially forestry literature, at infraspecific rank. There is therefore only a weak case for a proposal either to reject *P. apulcensis* Lindley or to conserve it with a conserved type, and I strongly prefer to correct the errors made before I take up the name in the sense of its type in *Flora Neotropica*.

*Acknowledgments.* Thanks are due to staff at the Herbarium of the Museum of Natural History in Vienna, in particular B. Wallnöfer, who alerted me to the existence of old carpological material in W despite its presumed destruction during World War II, and who granted a loan to Oxford (FHO) of the relevant material.

Literature Cited

Carvajal, S. & R. McVaugh. 1992. *Pinus* L. Pp. 32–100 *in:* R. McVaugh, Flora Novo-Galiciana 17. Gymnosperms and Pteridophytes. Univ. Michigan Herbarium, Ann Arbor.

Dümmer, R. A. 1913. The conifers of the Lindley herbarium; Botany School, Cambridge. J. Roy. Hort. Soc. 39 (1): 63–91.

Endlicher, S. L. 1847. Synopsis Coniferarum. Scheitlin & Zollikofer, Sangalli (Sankt Gallen).

Greuter, W., F. R. Barrie, H. M. Burdet, W. G. Chaloner, V. Demoulin, D. L. Hawksworth, P. M. Jørgensen, D. H. Nicolson, P. C. Silva, P. Trehane & J. McNeill, Editors. 1994. International Code of Botanical Nomenclature (The Tokyo Code), Adopted by the XVth International Botanical Congress, Yokohama, August–September, 1993. Regnum Veg. 131.

Harrison, S. G. 1965. Note on gymnosperm nomenclature. Taxon 14: 247.

Lindley, J. 1839. Miscellaneous notices: Mexican pines. Edwards's Bot. Reg. 25: 63.

Loock, E. E. M. 1950. The pines of Mexico and British Honduras. S. Africa Dept. Agric. and Forest. Bull. 35.

Loudon, J. C. 1842. An Encyclopaedia of Trees and Shrubs; Being the Arboretum et Fruticetum abridged. Published by the author, London.

Martínez, M. 1945. Las pinaceas mexicanas. Anales Inst. Biol. Univ. Nac. México 16: 1–345.

———. 1948. Los Pinos Mexicanos, ed. 2. Edicionas Botas, Mexico City.

McVaugh, R. 1972. Botanical exploration in Nueva Galicia, Mexico, from 1790 to the present time. Contr. Univ. Michigan Herb. 9: 205–357.

Mirov, N. T. 1958. *Pinus oaxacana*, a new species from Mexico. Madroño 14: 145–150.

Perry, J. P. 1991. The Pines of Mexico and Central America. Timber Press, Portland, Oregon.

Shaw, G. R. 1909. The pines of Mexico. Publ. Arnold Arbor. 1.

Stafleu, F. A. & R. S. Cowan. 1981. Taxonomic Literature 3 [TL-2]. Regnum Veg. 105, Bohn, Scheltema & Holkema, Utrecht.

Stead, J. W. 1983. Studies of variation in Central American pines V: A numerical study of variation in the Pseudostrobus group. Silvae Genet. 32: 101–114 [115].

——— & B. T. Styles. 1984. Studies of Central American pines: A revision of the "pseudostrobus" group (Pinaceae). Bot. J. Linn. Soc. 89: 249–275.

# *Aureliana darcyi*, a New Species of Solanaceae from Brazil

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ABSTRACT. A new species of the genus *Aureliana* from the coastal vegetation and secondary forest of Paraty Municipality is described. It is distinguished from other species in this genus by the long-acuminate calyx lobes and sparse pubescence.

The genus *Aureliana* Sendtner was recently revised by Hunziker & Barboza (1991), who recognized eight taxa, all found in Brazil and concentrated in the central-western, southeastern, and southern regions.

During a floristic survey carried out by the Rio de Janeiro Botanical Garden in the Cairuçu Environmental Protection Area, Praty Municipality, Rio de Janeiro state, a morphologically distinct species of *Aureliana* was discovered.

**Aureliana darcyi** Carvalho & Bovini, sp. nov. TYPE: Brazil. Rio de Janeiro: Paraty, Apa–Cairuçu, ilha das Almas, na orla da ilha, 15 Mar. 1989, *A. L. Almeida, B. Kurtz et al. 7* (holotype, RB; isotype, MO). Figures 1–7.

Arbor ca. 2–3 m alta; ramis dichotomis puberulis. Folia solitaria, membranacea, glabrescentia, trichomatibus simplicibus vestita. Inflorescentiae ex fasciculis 4–12-floris constantes, receptaculo recto; pedicellis filiformibus apice vix dilatato. Flos in alabastra globosus; calyce campanulato, lobulis longe acuminatis aequalibus aestivatione liberis; corolla viridi; staminum filamentis ca. 2.5 mm longis, antheris ca. 1.5 mm longis. Bacca globosa; placenta expansa protuberationes formante; seminis testa reticulata.

Shrub or small tree ca. 2–3 m, branches dichotomous with distinct longitudinal ribs, puberulent, with simple hairs and lenticels. Leaves solitary, membranaceous, dark green above and light green underneath, 3.0–12.0 × 0.8–4.5 cm, lanceolate, acuminate, base slightly decurrent, venation camptodromous, glabrate to pubescent, hairs simple; petiole flattened, 1.0–1.5 cm, puberulent. Inflorescence 4–12-fasciculate, receptacles straight, peduncle 0.3–1.2 cm. Flowers green, axillary. Calyx whitish green, campanulate, ca. 3 mm, lobes 1.0–2.0 mm, regularly long-acuminate, glabrate externally. Corolla green, when mature white with green macula, 1.7–1.9 cm, rotate-stellate; lobes 5.0–6.0 mm, lanceolate, reticulate-veiny, margins ciliate. Pedicel 0.9–1.0 cm, filiform, slightly enlarged at the apex. Anthers light brown, ca. 1.5 mm, basifixed, filaments white, ca. 2.5 mm, filiform. Ovary less than 1.0 mm, globose to ovoid; style ca. 1.0 mm, stigmatic region apical. Fruit green, globose, ca. 1.0 cm diam., pericarp thick, placenta with protuberances. Calyx not persistent in fruit, ca. 70 seeds, 0.2–0.3 mm long, oblong, testa reticulate.

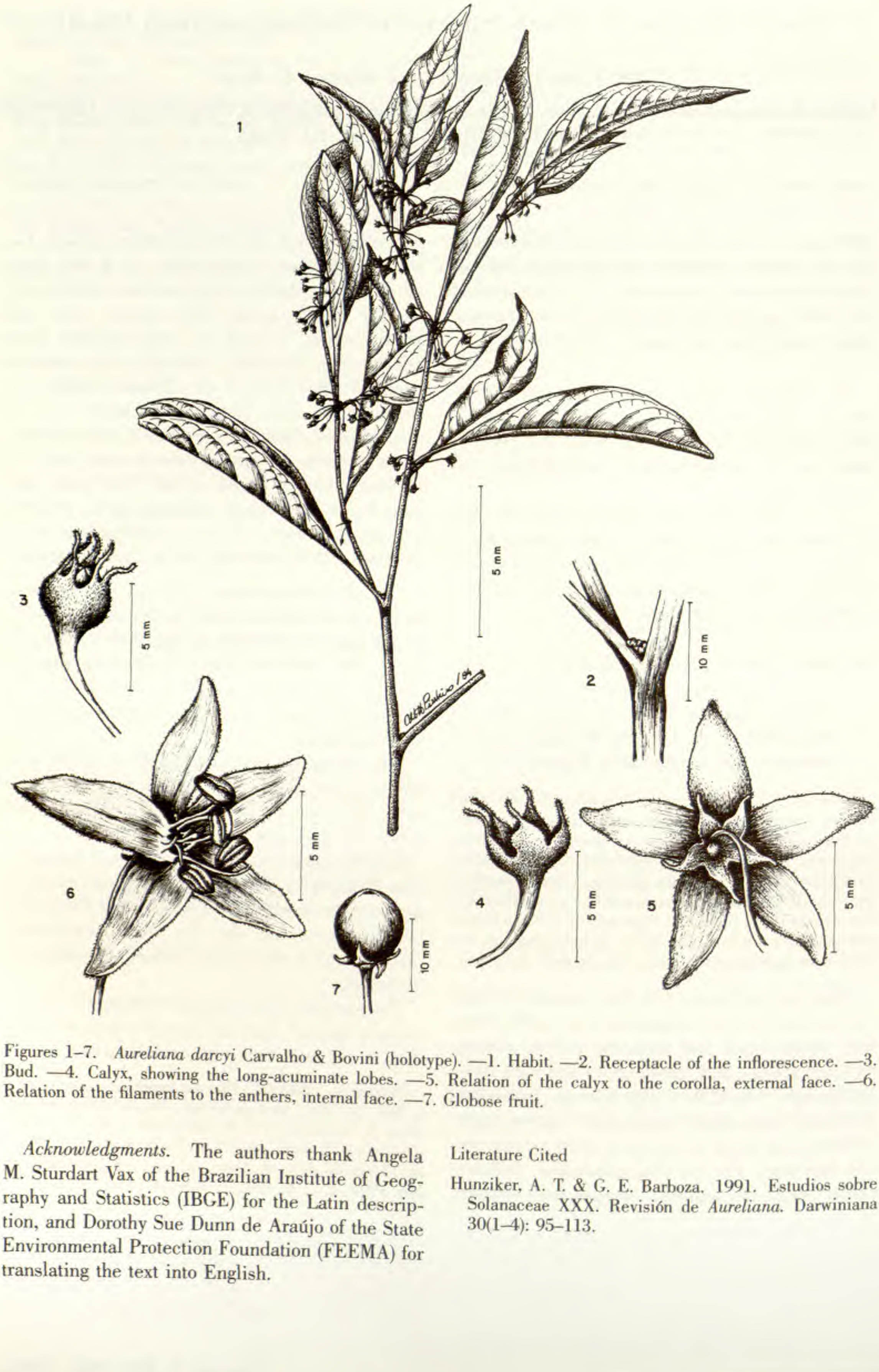
This plant was growing in the sun near sea level on an island (ilha das Almas) in the Atlantic Ocean. At the time of collection, it appeared to be in full flower with different stages of flowering present. The type specimen was collected in secondary forest, in full sunlight. It is hairier and the leaves are wide-lanceolate.

The characters that distinguish *A. darcyi* from other species of the genus are the long-acuminate calyx lobes and the absence of indumentum on the exterior of the calyx.

*Aureliana darcyi* is closely related to *A. wettsteiniana* (Witasek) A. T. Hunziker & Barboza, as shown by characteristics of the calyx lobes and flower bud. Overall appearance plus the sparse pubescence place it near *A. fasciculata* (Vellozo) Sendtner var. *fasciculata*.

The specific epithet honors William G. D'Arcy, eminent botanist from the Missouri Botanical Garden, for his important work on Solanaceae.

*Paratypes.* BRAZIL. **Rio de Janeiro:** caminho para a Toca do Ouro, próx. à estrada Parati-Cunha, 03 Jul. 1992, *L. C. Giordano, E. F. Guimaraes et al. 1312* (RB); passando a 18 ponte entrar à direita (sentido RJ/SP) à ca. de 13 km do trevo de Praty, subindo o Rio Corisco, 29 Jun. 1993, *R. C. C. Reis, R. Marquete et al. 32* (RB).




Figures 1–7. *Aureliana darcyi* Carvalho & Bovini (holotype). —1. Habit. —2. Receptacle of the inflorescence. —3. Bud. —4. Calyx, showing the long-acuminate lobes. —5. Relation of the calyx to the corolla, external face. —6. Relation of the filaments to the anthers, internal face. —7. Globose fruit.

*Acknowledgments.* The authors thank Angela M. Sturdart Vax of the Brazilian Institute of Geography and Statistics (IBGE) for the Latin description, and Dorothy Sue Dunn de Araújo of the State Environmental Protection Foundation (FEEMA) for translating the text into English.

Literature Cited

Hunziker, A. T. & G. E. Barboza. 1991. Estudios sobre Solanaceae XXX. Revisión de *Aureliana*. Darwiniana 30(1–4): 95–113.

# *Carex radfordii* (Section *Laxiflorae*: Cyperaceae), a New Species from the Southern Appalachians

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ABSTRACT. *Carex radfordii* Gaddy is a new species of *Carex* sect. *Laxiflorae* from the southern Appalachian Mountains of North Carolina, South Carolina, and Georgia. It is a robust species most closely allied to *Carex purpurifera* Mackenzie and *Carex laxiflora* Lamarck. Its long awns, glaucous blue-green blades, and brownish white basal sheaths distinguish it from other species of *Carex*.

*Carex* sect. *Laxiflorae* has been studied by various investigators in this century. Recently, Bryson (1980) carried out a morphological analysis, and Manhart (1984, 1985, 1986) conducted studies on the morphology, chemotaxonomy, and cytology of the section.

*Carex laxiflora* Lamarck, the namesake for section *Laxiflorae*, ranges across eastern North America from Maine and southern Quebec south to North Carolina west to Wisconsin and Indiana (Gleason & Cronquist, 1991). It is probably the most variable and complex species in section *Laxiflorae* and is easily confused with other species in this section. Cariciologists have often wondered whether *Carex laxiflora* was one species or a complex of species. Mackenzie (1935) described *C. purpurifera* Mackenzie from specimens that were previously thought to be *C. laxiflora*, and Bryson's (1985) description of *C. manhartii* Bryson indicates that *C. purpurifera* is, in fact, made up of at least two distinct elements.

The following species was first seen in the spring of 1979. Since then, I have observed the plant at numerous sites and mapped its distribution. I now conclude that it is a new taxon.

**Carex radfordii** Gaddy, sp. nov. TYPE: U.S.A. South Carolina: Oconee County, in shallow soil, over calcareous rocks, Station Cove, 25 Apr. 1986, *L. L. Gaddy s.n.* (holotype, CLEMS; isotypes, GA, MO, NCU, NY, US, USCH, WCUH, herbarium of C. T. Bryson). Figure 1.

A *Carex laxiflora* aristis squamis pistillatis longis et laminis venetis glaucis differt; a *Carex purpurifera* vaginis basalis albidis brunneis differt.

Plant caespitose perennial, culms 4–6 dm tall, strongly aphyllopodic, triangular, usually 1.5 × longer than blades. Basal sheaths brownish white, 3–9 cm long, cataphylls well developed, 1–7 cm long. Blades blue-green, glaucous on undersides, 2–5.5 cm long, 7–15 mm wide, midrib well developed, with small teeth dorsally. Staminate spikes 2–4 cm long, 3–6 mm wide, usually solitary, peduncles 4–12 cm long. Pistillate spikes 3–5, peduncles 4–12 cm long, bracts 4–10 cm long, 1–2 mm wide, apices acuminate, sheaths 1–3 cm long, ligules scarious, 4–6 mm long. Perigynia 3–10 per spike, 3–4.5 mm long, obovoid, light green, beak slightly recurved, to 1.5 mm long; scales acute to aristate, often asymmetrical, rarely retuse, serrulate awns 1–5 mm long, usually overtopping the beak of the perigynia, total scale and awn length 3–9 mm, midrib green, margins scarious and hyaline. Achenes obovoid, filling body of the perigynia, 1–2.5 mm long, 0.8–1.2 mm wide, styles exserted, stigmas 3.

I take pleasure in naming this species after Albert E. Radford, Professor Emeritus, University of North Carolina (Chapel Hill), and a lifelong student of *Carex*. In the mid 1970s, Dr. Radford told me that the Brevard Belt of the Carolinas and Georgia was a rich floristic zone that offered many potential discoveries. I honor him with this discovery.

Some of the essential characters of *C. radfordii*, *C. purpurifera*, *C. laxiflora*, *C. striatula* Michaux, and *C. manhartii* are compared in Table 1. As may been seen in the table, *C. radfordii* shares many characters with *C. purpurifera* and *C. laxiflora*, and fewer characters with *C. striatula* and *C. manhartii*. Furthermore, measurements of the height of the flowering culms, pistillate scale body length, and pistillate scale awn length overlap somewhat in these five species. In height of flowering culm, *C. radfordii* is a robust species that can only be compared to *C. purpurifera*. Its blue-green blades (not obvious in herbarium specimens), which are glaucous on the undersides, are similar to those of *C. purpurifera*, except for the lack of purplish pigment in the basal sheaths. Its pistillate scale awns are usually much longer than those of *C. laxiflora*, *C.*

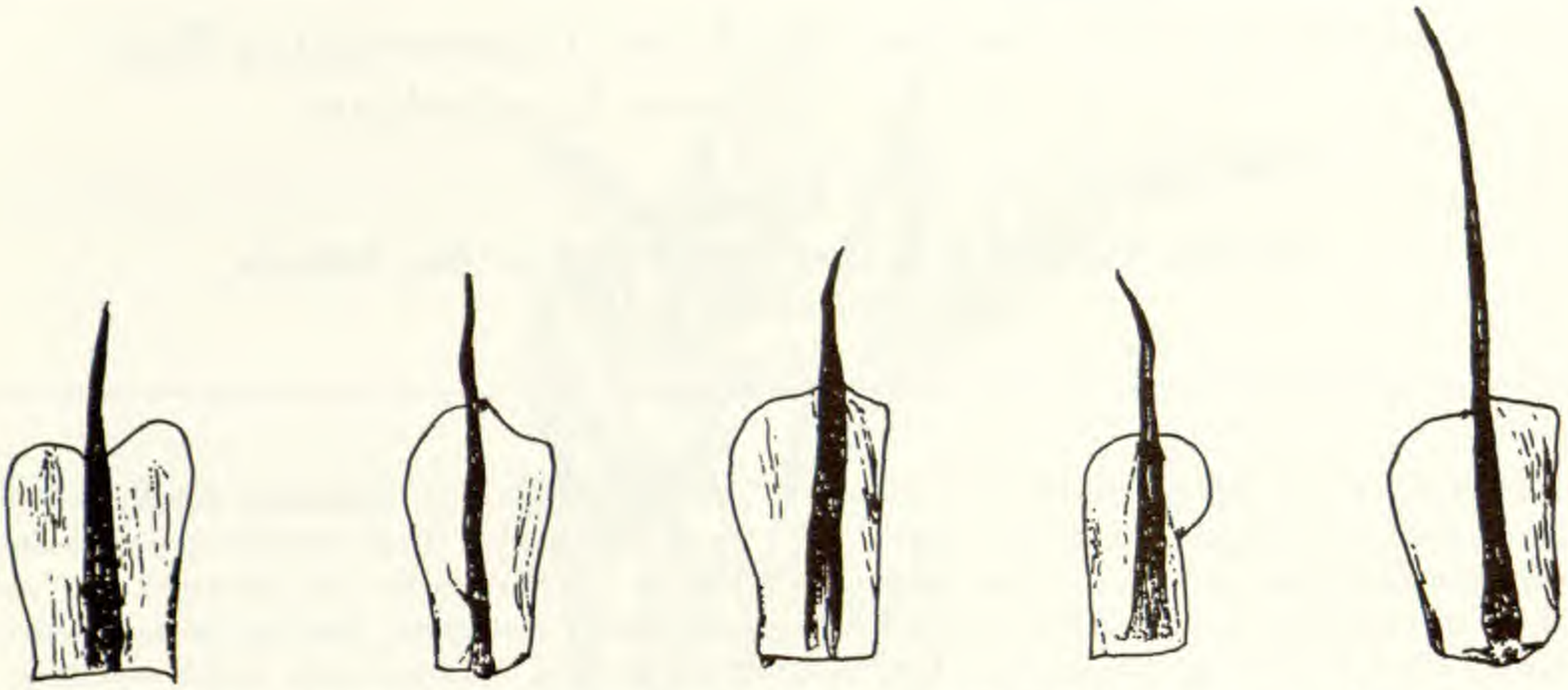

Figure 1. Variation in pistillate scale shape and awn length in *Carex radfordii* Gaddy: from lower and upper pistillate spikes of the type specimen. 9×. Illustration by Hu Ye.

*striatula*, and *C. manhartii*. Occasionally, the awns of *C. purpurifera*'s pistillate scales approach those of *C. radfordii* in length; however, on a given plant, the mean pistillate scale awn length is always greater in *C. radfordii*. The shape of the pistillate scale awn in *C. radfordii* is also distinct from that of other related species. In *C. laxiflora*, *C. striatula*, and *C. manhartii*, the pistillate scales are acute to awned; in *C. purpurifera*, the scales are more variable, often being retuse; in *C. radfordii*, the scales are long-awned to rarely retuse, with a majority usually asymmetrical. Chromosome number in *C. radfordii* has been determined to be $n = 23$, which separates it from all related species (Robert Naczi, unpublished data; Manhart, 1986).

*Carex radfordii* can be delimited from related species by several characters, as may be seen in the key below. From *Carex manhartii* and *C. purpurifera*, to which it appears to be most closely related, it can be separated by its brownish white culm bases. From *C. laxiflora* and *C. striatula*, it can be distinguished by its blue-green blades with glaucous undersides and its asymmetrical pistillate scale bodies with extremely long awns.

Upon first examination, *C. radfordii* appears to be an "albino" *C. purpurifera*. Closer inspection, however, reveals that the staminate spikes of *C. radfordii* are significantly longer than those of *C. purpurifera* and that the pistillate scales are more variable in shape in *C. radfordii*. Other good field characters for *C. radfordii* are its erect flowering culms (those of *C. laxiflora* and *C. striatula* usually lean over) and its strongly aphyllopodic culm bases.

*Carex radfordii* is found in rich, often rocky, cal-

Table 1. *Carex radfordii* and its allies.

| Character | *C. radfordii* | *C. purpurifera* | *C. laxiflora* | *C. striatula* | *C. manhartii* |
|---|---|---|---|---|---|
| Height of flowering culms | 4–6.5 dm | 3.7–6.7 dm | 3.1–5 dm | 3–5.5 dm | 2.1–3.9 dm |
| Blade color | Blue-green, glaucous underside | Blue-green, glaucous underside | Dark green | Whitish blue-green | Dark green |
| Basal sheath color | Brownish white | Purple | Brownish white | Brownish white | Reddish purple |
| Shape of pistillate scale | Long-awned to asymmetrical to retuse | Long-awned to retuse | Acute to awned | Acute to awned | Acute to awned |
| Scale length | 2–4 mm | 1.7–5 mm | 2–4.5 mm | 1.5–5.7 mm | 3.5–4 mm |
| Awn length | 1–5 mm | 1–5 mm | 0.5–2.3 mm | 0.8–3.7 mm | 0.1–3.5 mm |
| Chromosome number | $n = 23$ | $n = 17, 18, 19$ | $n = 20$ | $n = 18, 20$ | $n = 14$ |

careous woodlands on well-drained soils. The plant is found from about 300 m to just under 650 m in elevation. Of the closely related species discussed in Table 1, *Carex radfordii* is sympatric only with *C. manhartii* (see below). Most known sites are located in the Brevard or Chauga Belt, a belt of metasedimentary rock along a transition zone between the Piedmont and the Blue Ridge of the Carolinas and Georgia. The rocks of this belt have weathered to produce soils with high concentrations of calcium and magnesium (Hatcher, 1969). The soil pH at *C. radfordii* sites is fairly high for the generally acidic southern Blue Ridge region; at Station Cove, the type locality, the pH is 6.0 (Gaddy, 1990). Although it occurs in rich coves with *C. austro-caroliniana* Bailey, *Carex radfordii* is usually found at rockier, better-drained microsites than those occupied by *C. austro-caroliniana.* Below Whitewater Falls, North Carolina, *C. radfordii* grows alongside of *C. manhartii.* When a plant of *C. radfordii* from the type locality was experimentally grown in low calcium, low pH soils with a plant of *C. laxiflora* from the Blue Ridge of North Carolina and a plant of *C. striatula* from the Piedmont of South Carolina, all three species retained their distinguishing morphological characteristics.

KEY TO *C. RADFORDII* AND RELATED SPECIES

1a. Base of culms brown, brownish white, or white.
  2a. Blades whitish green to blue-green, undersides white striolate; pistillate scales symmetrical, awns 0.5–3.7 mm long.
    3a. Blades whitish green to blue-green . . . . . *C. striatula*
    3b. Blades dark green . . . . . *C. laxiflora*
  2b. Blades blue-green, undersides glaucous; pistillate scale bodies often asymmetrical, awns 1–5 mm long . . . . . *C. radfordii*
1b. Base of culms reddish, reddish purple, or purplish.
  3a. Blades green, undersides not glaucous . . . . . *C. manhartii*
  3b. Blades blue-green, undersides glaucous . . . . . *C. purpurifera*

*Paratypes.* U.S.A. **Georgia:** Stephens County, Cedar Creek, Camp Mikell Rd. off Ga. Rt. 184, just W of Camp Mikell, N of Toccoa, elev. ca. 300 m, deep gorge, 19 June 1975, *D. E. Boufford 16552 & E. Wood* (GA). **North Carolina:** Macon County, Whitewater Falls, just below falls on lower portion of rich slopes, 15 May 1994, *L. L. Gaddy s.n.* (CLEMS). **South Carolina:** Greenville County, with *Carex austro-caroliniana* and *Cladrastis kentuckea* off Bentfield Rd. N side of Saluda River, 17 May 1993, *S. R. Hill 25034* (CLEMS); Oconee County, in rich, calcareous woods along Ramsey Creek below Rich Mountain, 20 Apr. 1992, *L. L. Gaddy s.n.* (CLEMS); Rich woods, Station Cove, 22 Apr. 1986, *L. L. Gaddy s.n.* (CLEMS); NE side of ridge at Tamassee Creek, Rich cove woodland, Comp. 17, Stnd. 16, 8 May 1993, *S. R. Hill 24994* (CLEMS). Pickens County, Rich woods, below "the Narrows" in the Eastatoe Gorge, 23 Apr. 1987, *L. L. Gaddy s.n. with D. A. Rayner* (CLEMS); 1.3 mi. S of NC line, N of Rocky Bottom, elev. ca. 2100 ft., diverse mesic forest slope near creek crossing, soil a rich alkaline or neutral loam, occasional to frequent, conspicuously glaucous perennial, 10 Apr. 1988, *S. R. Hill 19102* (CLEMS); shaded rich mesic woodland, 1.3 mi. S of NC line, N of Rocky Bottom, elev. ca. 2100 ft., occasional glaucous herb on steep slope, 9 May 1988, *S. R. Hill 19271 with C. Horn* (CLEMS).

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Literature Cited

Bryson, C. T. 1980. A Revision of the North American *Carex* Section *Laxiflorae* (Cyperaceae). Ph. D. Dissertation, Mississippi State University, Mississippi State.

———. 1985. A new species of *Carex* (section *Laxiflorae*) from the southern Appalachians. Castanea 50: 15–18.

Gaddy, L. L. 1990. Glade Fern Ravine, a rich fern site in the Blue Ridge Province of South Carolina. Castanea 55: 282–285.

Gleason, H. A. & A. Cronquist. 1991. Manual of the Vascular Plants of Northeastern United States and Adjacent Canada. Van Nostrand, 2nd ed., The New York Botanical Garden, Bronx, New York.

Hatcher, R. D. 1969. Stratigraphy, petrology, and structure of the low rank belt of the Blue Ridge of the northwesternmost South Carolina. Geologic Notes 13: 105–141.

Mackenzie, K. K. 1935. *Carex purpurifera* and *Carex laxiflora. In:* North American Flora 18: 253–255.

Manhart, J. R. 1984. A biosystematic study of *Carex* (section *Laxiflorae*). Ph.D. Dissertation, University of Georgia, Athens.

———. 1985. Foliar flavonoids of the North American members of *Carex* section *Laxiflorae* (Cyperaceae). Biochem. Syst. and Ecol. 14: 85–90.

———. 1986. Cytology of *Carex purpurifera* Mack. (Cyperaceae). Rhodora 88: 141–147.

# New Species of Southern African *Moraea* (Iridaceae–Iridioideae), and the Reduction of *Rheome*

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ABSTRACT. Two new species of the large African genus *Moraea* (125 species), *M. rivulicola* and *M. regalis*, both members of subgenus *Vieusseuxia*, are described here. *Moraea rivulicola* has cream to greenish flowers, unusually long capsules, and is a robust plant restricted to the banks and beds of seasonal streams in Namaqualand, in the northwestern part of South Africa. *Moraea regalis* is known from one locality, near De Rust in the Little Karoo, South Africa. Both species occur in the semiarid winter rainfall part of southern Africa, a region known for the richness and diversity of its flora. The genus *Rheome*, now believed to be most closely related to species of *Moraea* subg. *Moraea*, is reduced to synonymy, and the three species of *Rheome* are transferred to *Moraea* as *M. maximiliani*, *M. nana*, and *M. umbellata*.

Over half of the estimated 1750–1800 species of the petaloid monocot family, Iridaceae, occur in southern Africa (Goldblatt, 1991, 1994). The area is well known botanically, yet despite more than 250 years of botanical exploration, novelties continue to be discovered there. Although the family is a significant element of the flora throughout the subcontinent, Iridaceae are most diverse in the southern and western parts of South Africa, a region of winter rainfall and summer drought. Two new species of *Moraea* are described here, both from this portion of southern Africa, and the genus *Rheome* is reduced to synonymy in *Moraea*. *Moraea* is the largest African genus of subfamily Iridoideae, and the central genus of Irideae–Homeriinae (Goldblatt, 1976, 1986a). At the last revising, Goldblatt (1986a) admitted 119 species to the genus. Since then one species, *M. vlokii* (Goldblatt, 1992), has been described. With the addition of the two new species described here and three transferred from *Rheome*, there are now 125 species in the genus. According to the revised taxonomy, some 110 species of *Moraea* occur in southern Africa, that is, south of the Zambezi–Cunene axis, most of them endemic, and by far the majority restricted to the semiarid and arid southwestern portion of the region.

## NEW SPECIES

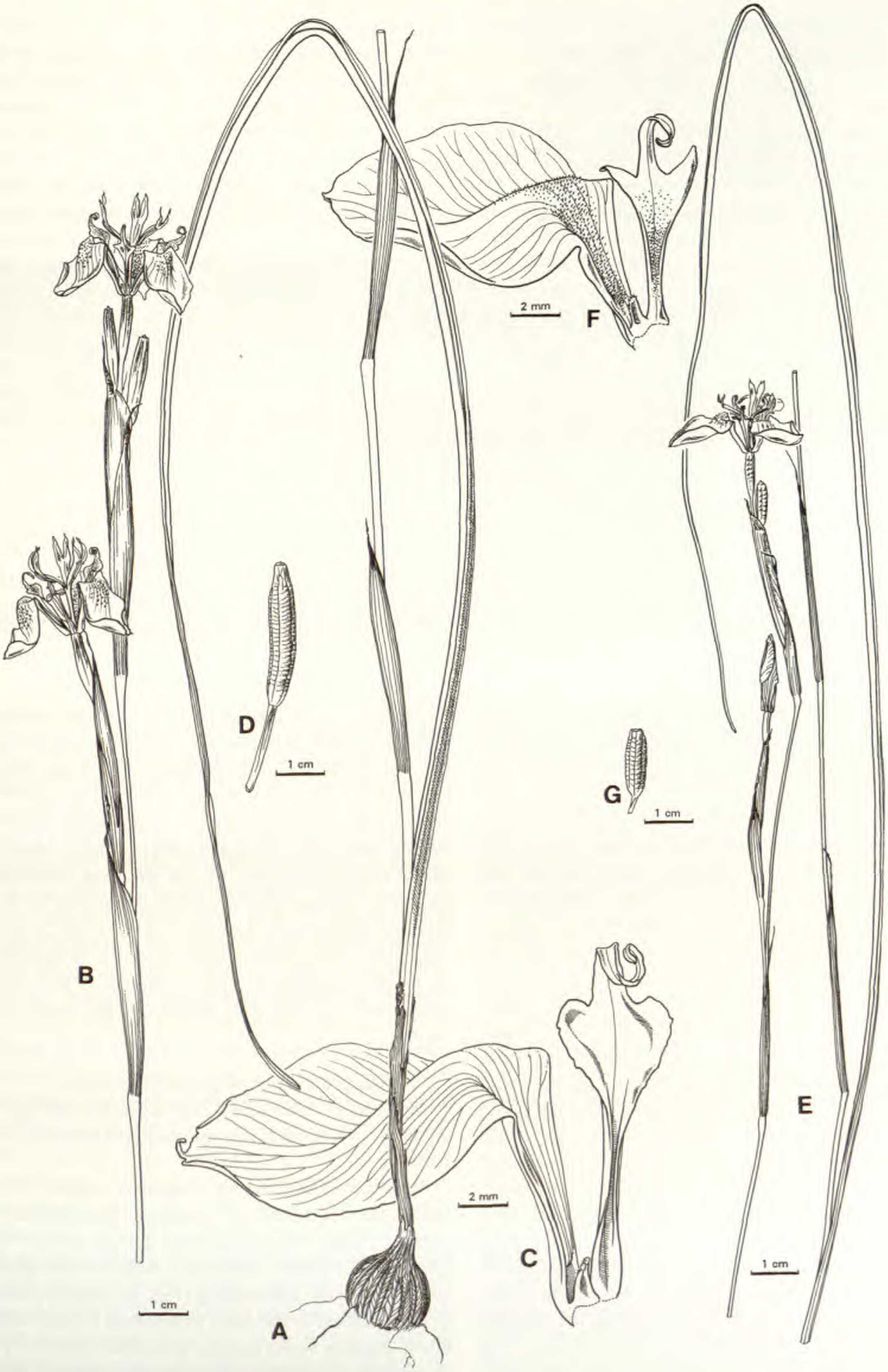
**1. Moraea rivulicola** Goldblatt & J. C. Manning, sp. nov. TYPE: South Africa. Northern Cape Province: Namaqualand, Springbok District, streambed at the eastern end of Spektakel Pass, 11 Sep. 1993, *Goldblatt & Manning 9710* (holotype, NBG; isotypes, K, MO, PRE, WAG). Figure 1A–D.

Plantae 50–80 cm altae, cormo globoso ca. 14–18 mm in diametro tunicis reticulatis, folio solitario lineare canaliculato ca. 10 mm lato, caule ramoso, floribus cremeis vel virescentibus vel pallide brunneis, tepalis exterioribus unguiculatis atropunctatis ad bases limborum 20–24 mm longis, limbis lanceolatis ca. 14 mm longis, unguibus canaliculatis 7–10 mm longis, tepalis interioribus 13–15 mm longis tricuspidatis, filamentis ca. 8 mm longis in columno ca. 5.5 mm longo connatis, antheris 4–5 mm longis, ramis styli ca. 6 mm longis, cristis 3–5 mm longis erectis, capsulis cylindricis 25–32 mm longis.

Plants 50–80 cm high. *Corm* globose, 14–18 mm diam., the tunics of pale, coarse vertical fibers connected by fine cross strands in herringbone pattern. *Cataphylls* usually dry and brown at flowering time, extending 5–10 mm above the ground. *Foliage leaf*

→

Figure 1. Morphology of *Moraea rivulicola* Goldblatt & J. C. Manning (*Goldblatt & Manning 9710*) and *M. unguiculata* Kew Gawler (*Goldblatt & Manning 9711*). *M. rivulicola*: —A. Corm and basal part of stem. —B. Upper part of stem. —C. Outer and inner tepal. —D. Capsule. *M. unguiculata*: —E. Leaf and upper part of stem. —F. Outer and inner tepal. —G. Capsule.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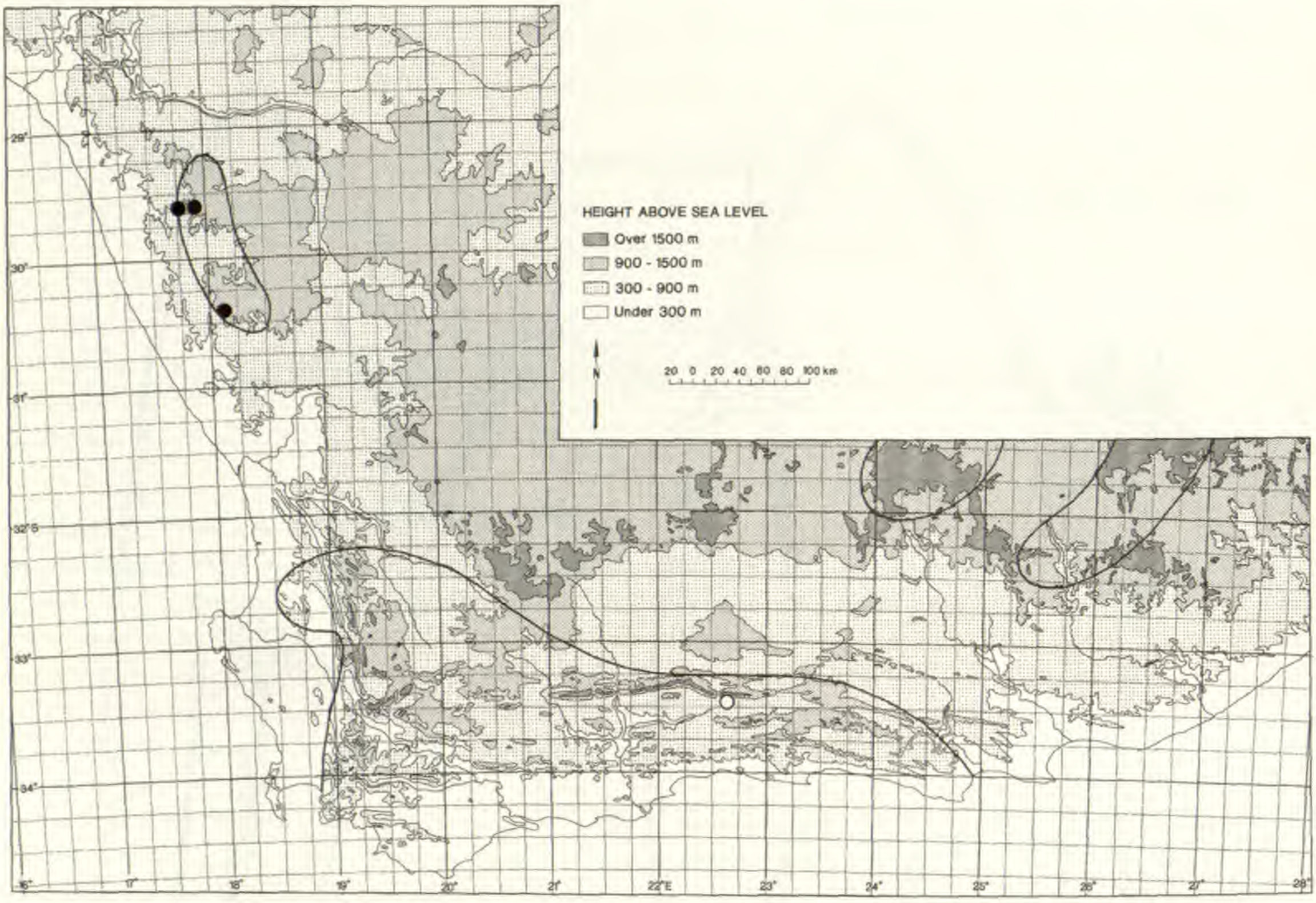


Figure 2. Distribution ranges of *Moraea rivulicola* (closed circles), *M. regalis* (open circle), and *M. unguiculata* (delimited by heavy lines).

solitary, basal, 2–2.5 times as long as the stem, channeled, 6–10 mm wide (when opened flat). *Stem* erect, consisting of 4(–5) internodes, straight and erect, the internodes 10–15 cm long, simple or with 1–3 branches, the branches held close to the axes, bearing an entirely sheathing bractlike leaf at each of the 3(–4) nodes, sheathing leaves 50–65 mm long, the apices attenuate-filiform. *Inflorescences* rhipidia, these single and terminal on each branch, several-flowered; *spathes* enclosing the rhipidia unequal, green, firm-textured, with dry brown attenuate apices, the outer ca. 45 mm long, the inner 55–67 mm long. *Flowers* cream, greenish or beige, with large nectar guides at the bases of the outer tepal limbs, these consisting of dark spots on a dull yellow field, the claws similarly dotted, both guide and outer tepal claws glabrous, inner tepals light to reddish brown, also densely spotted; *outer tepals* 20–24 × 10–13 mm, the claws ascending, channeled, 7–10 mm long, each with a large basal nectary, the nectary opposed by a lobe ca. 2 mm long, the limbs reflexed 45°–60° below horizontal, 14 × 10 mm; *inner tepals* 13–15 × 4–5 mm, the claws ascending, ca. 8 mm long, channeled, the margins usually partly conduplicate, the limbs trilobed, the median lobe linear, curving inward laxly and asymmetrically coiled, lateral lobes broad and weakly defined, obtuse, 1–2 mm long. *Filaments* ca. 8 mm long, united in a cylindric column ca. 5.5 mm long, free and diverging in the upper 2.5 mm; *anthers* 4–5 mm long, each appressed to the opposed style branch, shortly exceeding the stigma lobes, orange. *Ovary* oblong-trigonous, 11–14 mm long, exserted from the spathes; *style* dividing at the apex of the filament column, the branches ca. 6 × ca. 2 mm, diverging, each with paired terminal lanceolate crests 3–5 mm long. *Capsules* cylindric, 25–32 mm long; *seeds* angular, only known in the immature state.

Flowering mid August to late September.

*Etymology.* From the Latin *rivulicola,* "living in streams," referring to the specialized habitat of the species.

*Distribution and habitat.* *Moraea rivulicola* is a fairly rare endemic of northern Namaqualand, Northern Cape Province, South Africa. It extends from the Spektakel Mountains west of Springbok southward to the Kamiesberg (Fig. 2). Plants appear to be restricted to the beds of seasonal streams and along drainage lines, usually with their corms deeply wedged in crevices in the granite bedrock. Re-

cords are all from areas of fairly high elevation, and for Namaqualand, relatively high rainfall.

Although *Moraea rivulicola* was first collected in 1883 by Harry Bolus and in the past was thought to be no more than a large-flowered variant of the widespread and fairly common *M. unguiculata* Ker Gawler (Goldblatt, 1976, 1986a), field observations in Namaqualand in 1993 and 1994 show that this treatment is incorrect. At two sites some 100 km apart, *M. rivulicola* was found growing along and in small seasonal streams, while fairly typical *M. unguiculata* grew on adjacent well-drained slopes. Seen at the same time and in quite different habitats, it became evident that these were different species, not merely ecotypes or local variants of a single polymorphic one. Critical comparison of living plants showed that not only is *M. rivulicola* more robust vegetatively, and has larger flowers, but that there are several critical qualitative differences between it and *M. unguiculata.*

The flowers of *Moraea rivulicola* (Fig. 1A–C) are cream with a pale greenish or beige tinge, and the outer tepals are ca. 24 mm long with the limbs typically held at 60° below the horizontal. The nectar guides, located at the base of the tepal limb, are whitish covered with small dark brown to blackish spots, and both the nectar guide area and the tepal claws are smooth. The inner tepals are also distinctive: the central lobe of the tripartite limb is drawn into a slender obliquely coiled cusp, while the lateral lobes are obtuse and very short. The claws of the inner tepals are channeled and the margins are partly conduplicate, thus forming a nearly closed tube. The ovary is oblong-cylindric and 11–14 mm long, and gives rise to cylindrical capsules 25–32 mm long. Ripe seeds are unknown, but are probably larger than those of *M. unguiculata. Moraea unguiculata,* both in Namaqualand and elsewhere across its range, has smaller flowers with the outer tepals seldom exceeding 16 mm (Fig. 1E–G). Larger dimensions for the species given by Goldblatt (1976, 1986a) included plants now referred to *M. rivulicola.* The tepal limbs in Namaqualand populations of *M. unguiculata* are 8–10 mm long, and are held slightly below the horizontal, or flexed up to 45°, but in populations in the southern Cape, the limbs may be fully reflexed. Both the small nectar guide area and the outer tepal claws are densely pubescent. The inner tepals are 7–10 mm long, and also tripartite. The central cusp is long and symmetrically coiled inward, but the outer lobes are relatively longer and more distinctly formed than in *M. rivulicola,* and may be subacute. The inner tepal claws are more or less terete or slightly flattened on the adaxial surface. Flower color in *M. unguiculata* varies, ranging from pure white to cream, brownish, and even blue, and floral form (but not size) is unusually plastic (Goldblatt, 1986a). The outer tepal limbs may extend outward or, in some populations outside Namaqualand, may be completely reflexed.

The distinctive pale green leaves of *Moraea rivulicola* are relatively long, sometimes up to 2.5 times as long as the stem, thus over 1 m in length, broadly channeled, and 6–10 mm wide. The stems are 4–5 internodes long and bear 3–4 sheathing leaves 50–65 mm long. Leaves of *M. unguiculata* are darker gray-green, shorter, seldom more than a third again as long as the stem, and they are narrowly channeled, 2–3(–4) mm wide. The stems are 3 internodes long and bear 2 sheathing leaves 40–55 mm long. Thus the two species differ both in leaf and stem morphology as well as in floral structure.

Differences in the leaf texture and venation of the two species reflect notable anatomical differences (Fig. 3). In transverse section the leaf of *Moraea unguiculata* (Fig. 3B) is relatively thin. The heavily sclerified sheaths of the major bundles touch those of the opposing minor bundles and there is a large strand of subepidermal marginal sclerenchyma, not apparently associated with a vascular bundle (although a small central cavity suggests the presence of minor veins in early ontogeny). In comparison, the leaf of *M. rivulicola* is much thicker in transverse section (Fig. 3A), the sheaths of the major bundles are less heavily sclerified and the opposing minor bundles are well separated from them, and most significantly, there is a small marginal vein with a small sclerified phloem cap. These differences in leaf anatomy between the two species are of the kind most commonly associated with xeric versus more mesic habitats.

Habitat differences between *Moraea rivulicola* and *M. unguiculata* appear to be absolute. The latter grows on open exposed rocky sites, or on stony slopes, in both cases in well-drained and often arid situations. *Moraea rivulicola* has, however, so far only been found in seasonally wet habitats, waterlogged or even inundated for part of the growing season. In Namaqualand *M. unguiculata* may be found either on soils derived from shale, as in the Spektakel Mountains or near Steinkopf (Goldblatt, 1986a), or on granite-derived soils. *Moraea rivulicola* has only been found on pockets of granite-derived sand in rocky granite on the banks or in the beds of streams.

Both *Moraea rivulicola* and *M. unguiculata* belong to subgenus *Vieusseuxia,* members of which share the following synapomorphies: long-lasting flowers, a solitary foliage leaf, distinctive reticulate

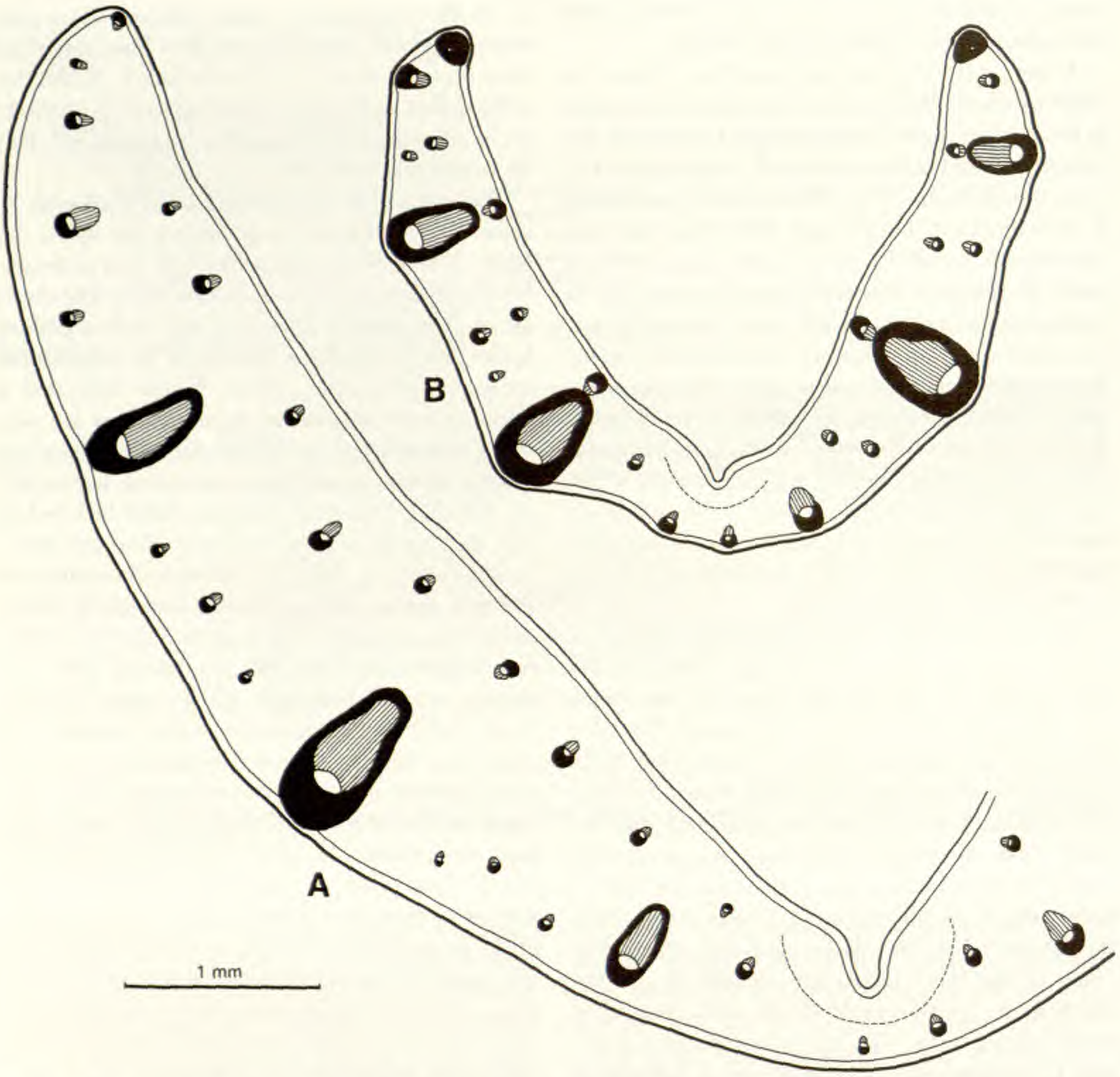


Figure 3. Transverse sections of leaves of *Moraea rivulicola* (A) and *M. unguiculata* (B). Solid black = sclerenchyma; hatching = xylem.

corm tunics composed of pale, soft-textured fibers, and an asymmetric karyotype with $x = 6$. Within the subgenus, *M. rivulicola* and *M. unguiculata* appear to be allied to those species that have similar trilobed inner tepals, inconspicuous nectar guides, and a long filament column. Other species in the alliance include the southwestern Cape species *M. tricuspidata* (L. fil.) G. Lewis and *M. bellendenii* (Sweet) N. E. Brown, and the eastern southern African *M. trifida* R. Foster, *M. pubiflora* N. E. Brown, and *M. brevistyla* (Goldblatt) Goldblatt.

*Paratypes.* SOUTH AFRICA. **Northern Cape:** 2917 (Springbok) 22 km W of Springbok, eastern slopes of Spektakel Mountains, in streambed (DA), 26 Sep. 1974, *Goldblatt 2791* (MO, PRE); streambed at the eastern end of Spektakel Pass, 4 Sep. 1994, *Goldblatt & Manning 9971* (MO, NBG); rocky places near Modderfontein (DB), Sep. 1883, *H. Bolus 6618* (BOL). 3018 (Kamiesberg) eastern slopes of Rooiberg, ca. 1050 m (AC), 14 Oct. 1976, *Goldblatt 4313* (MO, PRE); Kamiesberg Mountains, farm Welkom, streambed near the top of Langkloof, 14 Sep. 1993, *Goldblatt & Manning 9770* (MO).

**2. Moraea regalis** Goldblatt & J. C. Manning, sp. nov. TYPE: South Africa. Western Cape: Little Karoo, De Rust, rocky hillside near old cemetery, 19 Sep. 1994, *J. A. Vlok & A. L. Schutte 345* (holotype, NBG; isotypes, K, MO, PRE, WAG). Figure 4.

Plantae 18–25(–35) cm altae, cormo globoso 12–14 mm in diametro tunicis reticulatis, folio solitario lineare canaliculato, caule eramoso, floribus violaceis, tepalis exterioribus albis notatis unguiculatis (26–)30–40 mm longis, limbis lanceolatis 13–20 mm longis, tepalis interioribus 20–24 mm longis erectis saepe unguiculatis et limbis tri-

Figure 4. Plant and flowers of *Moraea regalis* Goldblatt & J. C. Manning (*Vlok & Schutte 345*). Note old corm tunics persisting around the stem and no longer at the base of the plant.

cuspidatis, filamentis 12–15 mm longis connatis in columno 9–10 mm longo, antheris 6–9 mm longis, ramis styli 10–12 × 2 mm divergentibus, cristis anguste lanceolatis vel linearibus 5–8 mm longis.

Plants 18–25(–35) cm high. *Corms* globose, 12–14 mm diam., the tunics of medium to coarsely textured reticulate fibers, light brown. *Cataphylls* dry and brown at flowering time. *Foliage leaf* solitary, basal, half again to twice as long as the stem, linear and canaliculate, ca. 3 mm wide (when opened flat), upright below, trailing above. *Stem* erect, 3 internodes long, straight and erect, unbranched, the lowermost internode shortest and the uppermost longest, bearing an entirely sheathing bractlike leaf at each node, these 25–40 mm long, the apices attenuate. *Inflorescence* a single, usually 2-flowered terminal rhipidium; enclosing spathes unequal, green, firm-textured, with dry brown attenuate apices, the outer 25–40 mm long, the inner 45–65 mm long. *Flowers* violet, the limbs of the outer tepals each marked at the base with a small white triangular nectar guide outlined with a dark purple zone, the base of the outer tepal limb minutely pubescent, the claw heavily pubescent, the hairs dark violet, evidently without nectar, scentless; *outer tepals* (26–)30–40 mm long, the claws ascending, 12–16 mm long, with a smooth deltoid zone at the base, evidently a vestigial perigonal nectary, the limbs 13–20 mm long, directed downward at right angles to the ground; *inner tepals* erect and ± linear to slightly wider just below the midline, thus obscurely clawed, 20–24 mm long, the claw ca. 12 mm long, the limb aristate or occasionally tricuspidate, then the lateral lobe 1–2 mm long, and central cusp ca. 10 mm long. *Filaments* 12–15 mm long, united below in a cylindric column 9–10 mm long, free and diverging in the upper 3–5 mm; *anthers* 6–9 mm long, each appressed to the opposed style branch, just shorter than or just exceeding the stigma lobes, the pollen orange. *Ovary* oblong-trigonous, 8–10 mm long, usually fully exserted from the spathes, style dividing just above the apex of the filament column, the branches 10–12 × 2 mm, diverging, each with paired terminal, narrowly lanceolate to linear crests 5–8 mm long. *Capsules* ovoid-oblong, 12–16 mm long; *seeds* angular and prismatic, ca. 1.5 mm long.

Flowering mid August to mid September.

*Etymology.* From the Latin *regalis*, "royal," referring to the dark blue-purple or violet color of the flowers.

*Distribution and habitat. Moraea regalis* appears to have been collected for the first time in 1993, when it was found near the Little Karoo town

of De Rust (Fig. 2). So far it is known only from a single locality, south-trending slopes of a rocky hill south of De Rust. The substrate is sandy soil derived from Enon Conglomerate.

Like *Moraea rivulicola*, described above, *M. regalis* is a typical member of subgenus *Vieusseuxia*. It is distinguished in the genus and subgenus by the striking dark violet flower color, the relatively large flower size with the outer tepals 26–40 mm long, the long tepal claws, and the narrow, either aristate and more or less linear or tricuspidate inner tepals (Fig. 4). Its affinities lie with *M. unguiculata* and *M. algoensis* Goldblatt, both of which have smaller flowers and trilobed inner tepals with a large incurved central cusp and small but broadly obtuse lateral lobes. The slender filament column and narrow style branches are also typical of this group of species.

*Paratype.* SOUTH AFRICA. **Western Cape:** 3322 (Oudtshoorn) Little Karoo, De Rust, hill S of the town, stony S-facing slopes (BC), Sep. 1993, *J. A. Vlok & A. L. Schutte s.n.* (MO).

## Reduction of *Rheome* Goldblatt

*The genus Rheome* was erected by Goldblatt (1980) to accommodate two species of *Homeria, H. umbellata* (Thunberg) G. Lewis and *H. maximiliani* Schlechter. These differed from other species then included in *Homeria* in their brown, nonreticulate corm tunics, apically diverging outer inflorescence spathes, and apically crowded rhipidia (inflorescence units) on the stem. The remaining species of *Homeria* have reticulate corm tunics composed of coarse black fibers, sheathing outer rhipidial spathes, and rhipidia that are not crowded apically. The basic chromosome number also differs in the two groups. Species of *Homeria* have $x = 6$, and secondarily $2n = 10$, 9, or 8, whereas *H. umbellata* and *H. maximiliani* have $x = 10$, considered to be the plesiomorphic chromosome number for Homeriinae (Goldblatt, 1976, 1980; Rudall & Goldblatt, 1993). Moreover, a series of crossing experiments showed that although most of the species of *Homeria* could be crossed with one another, none could be crossed with *H. maximiliani*. The latter, however, could be crossed with one species of a second genus *Hexaglottis, H. nana* L. Bolus, which also has the corm tunics, rhipidial spathes, and arrangement of the rhipidia characteristic of *Rheome*. Neither *Homeria maximiliani* nor *Hexaglottis nana* could be crossed with a selection of species of *Hexaglottis*. It was evident on the basis of morphological, cytological, and crossing evidence that *Homeria umbellata, H. maximiliani,* and *Hexaglottis nana* were a monophyletic group parallel to *Hexaglottis* and *Homeria* and that the close floral similarity to the latter two genera was due to convergence, most likely through the parallel reduction of the more complex *Moraea*-type flower, plesiomorphic in subtribe Homeriinae in its dimorphic inner and outer tepals and narrow style branches either bearing a reduced crest or lacking them entirely.

What was not evident when *Rheome* was described was that the distinctive corm tunics, inflorescence spathes, and arrangement of rhipidia characteristic of that genus have a parallel in *Moraea longiflora* Ker Gawler (subg. *Moraea* sect. *Tubiflora*). The second species of section *Tubiflora, M. cooperi* Baker, also has brown, nonreticulate corm tunics, but it has entirely sheathing rhipidial spathes and laxly disposed rhipidia. Basic chromosome number in subgenus *Moraea* is $x = 10$, which also accords with the number in *Rheome*. The discovery of *M. linderi* Goldblatt (Goldblatt, 1982) provided the missing link between *Rheome* and *Moraea*. This species has a flower typical of *Moraea,* having large outer tepals with conspicuous nectar guides, narrow inner tepals, broad style branches with paired petaloid crests, and a transverse stigma, but corms, corm tunics, rhipidial spathes and rhipidial arrangement of the type characteristic of *Rheome,* and a basic chromosome number of $x = 10$ (Goldblatt, 1986b).

Finally, a phylogenetic study of subtribe Homeriinae (Rudall & Goldblatt, 1993), using several leaf anatomical characters as well as morphology and chromosome cytology, provided evidence that *Rheome, Moraea* sect. *Tubiflora,* and two other species of section *Moraea, M. linderi* and *M. margaretae* Goldblatt, comprise a clade. The study did not include enough species to show, with any degree of confidence, the species or section most closely allied. Nevertheless, the evidence now available makes it clear that the species of *Rheome* and *Hexaglottis nana* are nested within a small clade of species of *Moraea* subg. *Moraea*. Under these circumstances, continued recognition of *Rheome,* a small genus nested within a section of the large and diverse *Moraea,* is clearly inconsistent with modern phylogenetic classification (Hennig, 1966; Donoghue & Cantino, 1988). We therefore propose to synonymize *Rheome* in *Moraea*. As noted above, *Rheome, H. nana, M. linderi,* and *M. margaretae* comprise a clade with the following apomorphic characteristics: nonreticulate, brown corm tunics; apically diverging outer rhipidial spathes, and a tendency for the crowding of rhipidia and foliage leaves near the stem apex. Some of these characters

are also shared by the members of section *Tubiflora* which, in addition, have the tepals united in a tube, apomorphic in *Moraea*. The absence of some of the above synapomorphies in *M. cooperi* is puzzling, and we suspect may be due to character reversal. The taxonomy of species transferred to *Moraea* is outlined below.

1. **Moraea maximiliani** (Schlechter) Goldblatt & J. C. Manning, comb. nov. Basionym: *Homeria maximiliani* Schlechter, Bot. Jahrb. Syst. 27: 94. 1900. *Rheome maximiliani* (Schlechter) Goldblatt, Bot. Not. 133: 92. 1980. TYPE: South Africa. Western Cape: Hoek, Clanwilliam District, *Schlechter 8700* (lectotype, designated by Goldblatt (1980), B; isotypes, BOL, K, MO, S).

2. **Moraea nana** (L. Bolus) Goldblatt & J. C. Manning, comb. nov. Basionym: *Hexaglottis nana* L. Bolus, Kew Bull. Misc. Inf. 1932: 326. 1932 [1933]. TYPE: South Africa. Western Cape: Clanwilliam District, without precise locality, *Weintraub s.n.* (holotype, BOL 19972).

3. **Moraea umbellata** Thunberg, Dissertatio de *Moraea* no. 16. 1787. *Homeria umbellata* (Thunberg) G. Lewis, J. S. African Bot. 14: 86. 1948. *Rheome umbellata* (Thunberg) Goldblatt, Bot. Not. 133: 92. 1980. TYPE: South Africa. Western Cape: near Piketberg, *Thunberg s.n.* (holotype, Herb. Thunberg 1230 at UPS).

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Literature Cited

Donoghue, M. J. & P. D. Cantino. 1988. Paraphyly, ancestors and the goals of taxonomy: A botanical defense of cladism. Bot. Rev. 54: 107–127.

Goldblatt, P. 1976. The genus *Moraea* in the winter rainfall region of southern Africa. Ann. Missouri Bot. Gard. 63: 657–786.

———. 1980. Redefinition of *Homeria* and *Moraea* (Iridaceae) in the light of biosystematic data, with *Rheome* gen. nov. Bot. Not. 133: 85–95.

———. 1982. A synopsis of *Moraea* (Iridaceae) with new taxa, transfers and notes. Ann. Missouri Bot. Gard. 69: 35l–369.

———. 1986a. Convergent evolution of the *Homeria* flower type in six new species of *Moraea* (Iridaceae) in southern Africa. Ann. Missouri Bot. Gard. 73: 102–116.

———. 1986b. The Moraeas of Southern Africa. Ann. Kirstenbosch Bot. Gard. 14: 1–224.

———. 1991. An overview of the systematics, phylogeny and biology of the southern African Iridaceae. Contr. Bolus Herb. 13: 1–74.

———. 1992. New species, chromosome cytology and notes on the southern African Iridaceae–Irideae: *Moraea, Roggeveldia* and *Homeria*. S. African J. Bot. 58: 209–214.

———. 1994. Geography of African Iridaceae. Pp. 931–940 *in* J. H. Seyani & A. C. Chikuni (editors), Proceedings of the XIIIth plenary Meeting AETFAT, Malawi, Volume 2. National Herbarium and Botanic Gardens of Malawi, Zomba.

Hennig, W. 1966. Phylogenetic Systematics. Translated by D. D. Davis & R. Zangerl. Univ. Illinois Press, Urbana.

Rudall, P. & P. Goldblatt. 1993. Leaf anatomy and systematics of Homeriinae (Iridaceae). Bot. J. Linn. Soc. 111: 379–397.

# A New *Rhynchospora* (Cyperaceae) from the Cordillera de Talamanca, Costa Rica

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ABSTRACT. *Rhynchospora cabecarae* Gómez-Laurito (Cyperaceae), a new species belonging to section *Racemosae* C. B. Clarke, is described and illustrated.

A new species of *Rhynchospora* Vahl (Cyperaceae) is described as a result of revision of material recently collected during a field trip to the Caribbean slope of the Cordillera de Talamanca in Costa Rica.

**Rhynchospora cabecarae** Gómez-Laurito, sp. nov. TYPE: Costa Rica. Limón: Talamanca, N flank of Cerro Casma, along Ujarrás-San José Cabécar trail, Cordillera de Talamanca, 9°20′30″N, 83°13′30″W, 2250–2270 m, 17 Mar. 1993, *M. Grayum 10354* (holotype, USJ). Figure 1.

Ex affinitate *R. boliviensis* C. B. Clarke atque *R. dissitiflorae* Steudel ex Böckeler, ab utroque characteribus inflorescentiarum et achaeniarum praecipue differt.

Perennial, loosely caespitose with short rhizomes and coarse roots. Culms covered by old sheaths, erect, stiff, ca. 60 cm tall, 2.5 mm thick, nodose, leafy with many cauline leaves. Leaves 8–20 cm long, erect, somewhat wiry; blades linear, 2–2.8 mm wide, gradually narrowed apically, the margins ciliate to scabrous, channeled, the midrib adaxially pilose, raised and ciliate abaxially. Sheaths striate, reddish brown, villous with soft, curled hairs. Inflorescence paniculate, of ca. 5 partial panicles, the panicles not exceeding the leaves, 1.5–2.5 cm long, 1.3–2 cm wide, of 11–23 ascending spikelets; the peduncles 1.3–2 cm long, terete to complanate, hirsute, the axis sparsely hirsute. Bracts leaflike. Bractlets subulate, 4–6 mm long, hirsute. Spikelets 6–7 mm long, 1–1.3 mm wide, acute, reddish brown, 2-fruited. Lower glumes empty, ovate, 2.5–3 mm long, mucronate, other flower-bearing glumes lanceolate, 4 mm long, 1.5 mm wide, membranous, mucronate at the tip. Achenes ovate-elliptic to elliptic, tumid, 1.2 mm long, 0.7 mm wide, with a conspicuous basal stipe 0.5 mm long, shiny-castaneous, cancellate with minute isodiametrical cells. Style-base conical, 1 mm high, 0.8 mm broad at base, dorsiventrally compressed, brown. Hypogynous bristles 5, upwardly scabrous, rather slender, shorter than the achene body, or often only 2 very short rudimentary ones. Stamens 3.

*Etymology.* This species is named after the Cabécar people, who inhabit the Talamanca region.

*Rhynchospora cabecarae* is a member of section *Racemosae* C. B. Clarke because of its short rhizome, culms covered by old sheaths, many cauline leaves, inflorescence paniculate, number of hypogynous bristles shorter than the achene body, often only 2 vestigials, and cancellate achenes. It is apparently related to *R. boliviensis* C. B. Clarke and *R. dissitiflora* Steudel ex Böckeler. As has recently been stated by Thomas (1993), this group is quite variable and rare. *Rhynchospora cabecarae* is known only from the type collection. It is distinguished from the above-mentioned species by the combination of characters in Table 1.

*Rhynchospora cabecarae* was found in an open scrubland with *Sphagnum* and shrubs and treelets of several families, including *Clusia* (Clusiaceae),

Table 1. Comparison of three related species of *Rhynchospora*.

| | *R. boliviensis* | *R. dissitiflora* | *R. cabecarae* |
|---|---|---|---|
| Inflorescences | A single open panicle with slender peduncles 1–5 cm long with solitary spikelets | 3–5 racemes, each with 1–4 spikelets with slender and pendant peduncles | 5 partial small panicles, each with 11–23 spikelets; peduncles short, 1–3 cm long |
| Achenes | Widely obovate, lenticular to plano-convex; brownish gray to straw color. Stipe none | Widely obovate, lenticular, pale brownish gray. Stipe none | Ovate to ovate-elliptic, tumid, shiny-castaneous, with a distinct stipe 0.5 mm long |

Figure 1. *Rhynchospora cabecarae* Gómez-Laurito (*Grayum 10354*, USJ). —a. Habit. —b. Partial panicle. —c. Achene.

*Prunus* (Rosaceae), *Vaccinium* (Ericaceae), *Ilex* (Aquifoliaceae), *Miconia* (Melastomataceae), *Palicourea* (Rubiaceae), *Gaiadendron* (Loranthaceae), *Monnina* (Polygalaceae), *Neomirandea* (Asteraceae), and *Phyllonoma* (Grossulariaceae) (M. Grayum, in litt. 1994).

*Acknowledgments.* I am grateful to Michael H. Grayum for reviewing the manuscript and to Judy Hoomans for the excellent illustration.

Literature Cited

Thomas, W. W. 1993. A synopsis of *Rhynchospora* (Cyperaceae) in Mesoamerica. Brittonia 44: 14–44.

# Two New Species in *Cuphea* (Lythraceae), and a Note on Alzateaceae

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ABSTRACT. *Cuphea* (sect. *Melvilla*) *alaniana* from central Mexico and *C.* (sect. *Diploptychia*) *armata* from Central America are described and illustrated. The monotypic family Alzateaceae, long known from Peru and Bolivia, and more recently discovered in Costa Rica, Panama, and Colombia, is here reported from Ecuador for the first time. Of the two Ecuadorian collections, one belongs to the northern, broad-leaved *Alzatea verticillata* subsp. *amplifolia*; the other is most similar to the southern subspecies *verticillata*. Apical leaf glands are a newly recognized feature of the genus. They are interpreted as extra-floral nectaries.

In revisionary studies of *Cuphea*, two new North American species were discovered among collections on loan from a number of North American herbaria. *Cuphea alaniana* is a large-flowered perennial of section *Melvilla*, subsection *Polyspermum* (Koehne, 1903). It is one of four species of the subsection, which is endemic to the western and southern mountains of Mexico. *Cuphea armata*, discovered in neighboring areas of Guatemala, El Salvador, and Honduras is a new species of section *Diploptychia*.

**Cuphea alaniana** S. A. Graham, sp. nov. TYPE: Mexico. Guerrero: Distrito Adama, Temisco, Barranca del Consuelo, 500 m, 15 Nov. 1937, *Mexia 8810a* (holotype, UC; isotype, GH). Figure 1a–d.

Suffrutices vel frutices, probabiliter ad 1.5 m, caulis simplex, erectus, viscosissimus. Petioli 5–10 mm longi, ad summum caulis sessiles; folia 25–100 mm longa, 5–35 mm lata, anguste lanceolata vel linearia. Flores 25–32 mm longi, rubro-purpurei, glanduloso-hispidi; lobus dorsalis calycis ceteris paullo major; appendices prominentes, setosae. Petala 6, roseo-purpurea, inaequalia, 2 dorsalia 7–9 mm longa, manifeste unguiculata, 4 ventralia 1.0–2.5 mm longa. Ovula 40–50. Discus 2–3 mm longus, 2.5 mm latus, 2 mm crassus, basi ovarii late affixus.

*Suffrutescent* or shrubby perennials, probably 0.5–1.5 m tall, stems simple, erect, from a fibrous-rooted base, branched distally in the inflorescence; stems and pedicels highly viscous, the vestiture densely, minutely glandular-puberulous and glandular-hispid, the hairs thin, erect, colorless or reddish purple, bulbous-based, minute (< 0.25 mm) or 0.5–1 mm long; internodes up to half as long as the subtending leaves. *Leaves* with petioles 5–10 mm long, becoming subsessile or sessile distally in the inflorescence; blades 25–100 mm long, 5–35 mm wide, membranous, crowded on the upper stem, narrowly lanceolate-linear, base acute, apex acute; blade surface minutely scabrous, or scabrous with sparse to abundant white, weak, slightly appressed hairs to 1 mm long, the margins of young leaves densely ciliate, the hairs erect, glandular-viscous, to 1 mm long; upper leaves very gradually diminishing in size to become the lanceolate-linear bracts of the inflorescence. *Inflorescences* densely flowered, terminal, leafy racemes; flowers solitary at the nodes, interaxillary; pedicels 4–6 mm long; bracteoles 1.5 mm long, lanceolate-linear or reduced to a few fleshy hairs, positioned 1.0–1.5 mm below the apex of the pedicel. *Floral tubes* 25–32 mm long, including a rounded, horizontal base extending 1 mm beyond the pedicel, 4–5 mm wide in lateral view at anthesis, dorsally slightly convex, the neck slightly or not at all narrowed, the mouth flaring, oblique in lateral view, the ventral side extended 1 mm or less beyond the dorsal side, the floral tube more distinctly convex and distended in fruit, the neck contracted; outer surface reddish purple, straw-colored ventrally at the mouth, glandular-puberulous and glandular-hispid with abundant, erect, thin, colorless or reddish purple hairs to 1 mm long; inner surface pale, neither bialate nor vesiculate, glabrous or lightly villous above the stamens, glabrous below; calyx lobes subequal, the dorsal lobe deltoid, 2 × 3 mm, the others 1 × 2 mm, margins not ciliated; appendages at the sinuses of the lobes prominent, 1 mm long, equaling the calyx lobes, thick, green or reddish purple, the apex bulbous, crowned by 5–8 setae 1–2 mm long. *Petals* 6, rose-purple, the 2 dorsal 7–9 mm long including a slender claw 1–2 mm long, narrowly obovate, the 4 ventral 1.0–2.5 mm long, linear-spathulate, caducous. *Stamens* 11, all inserted at ⅝ the length of the floral tube, the 2 dorsalmost shortest, included, the 5 antesepalous exserted, the 4 antepetalous included to subexserted; filaments gla-

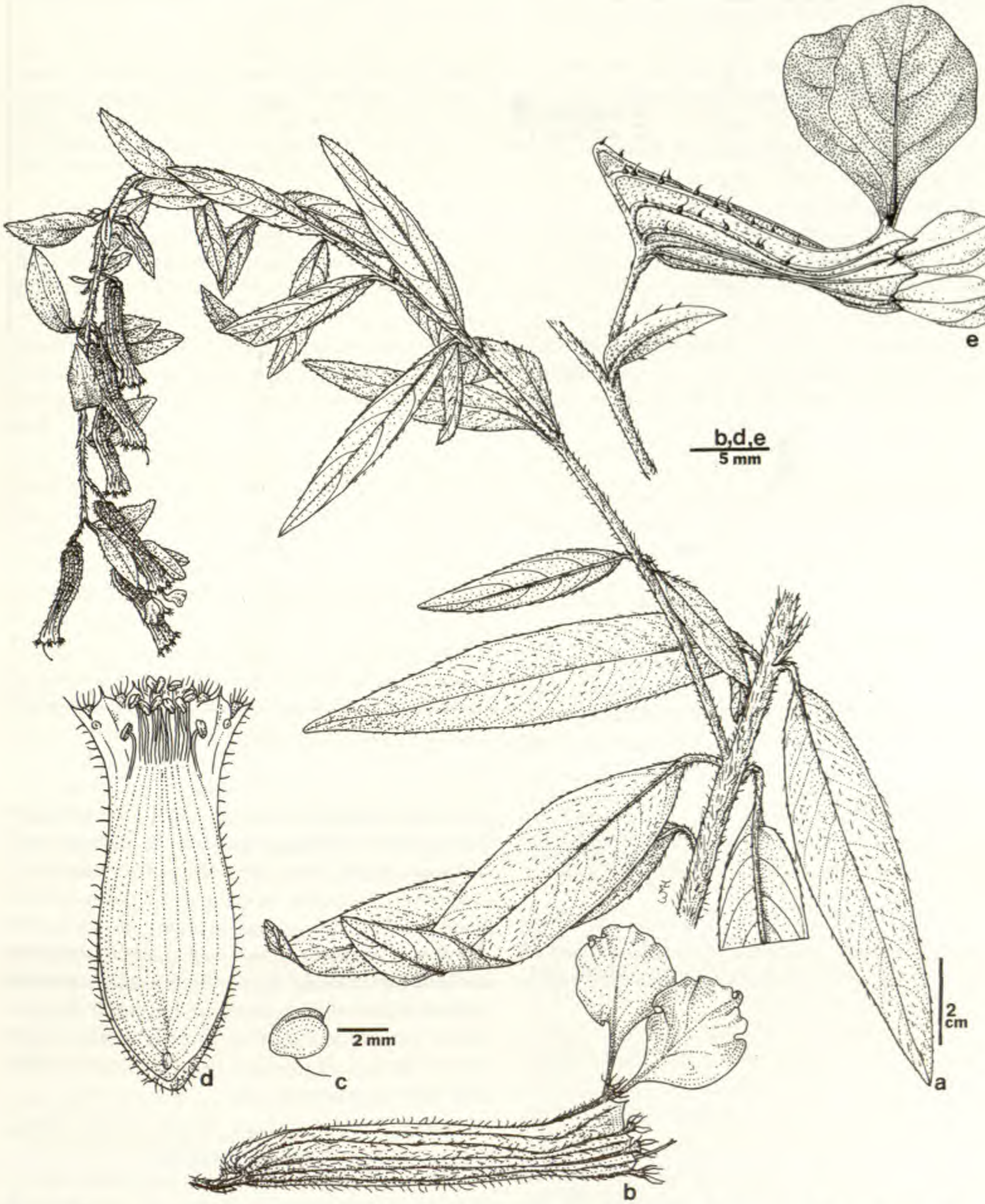


Figure 1. a–d, *Cuphea alaniana* S. A. Graham. —a. Habit. —b. Lateral view of flower. —c. Nectariferous disc at base of the ovary within the floral tube. —d. Floral tube opened dorsally, ovary removed to show position and number of stamens. —e. *Cuphea armata* S. A. Graham, lateral view of flower. Drawn from the holotypes.

brous to lightly villous, reddish; anthers purple. *Pollen* triangular in polar view; tricolporate, syncolpate, pores not protruding; exine uniformly finely striate, the striae extending ca. ½ the distance to the poles, partially anastomosing; diameter 24–28 $\mu$m in lactic acid. *Style* exserted at maturity, glabrous; stigma punctiform; ovary gibbous dorsally, the gibbosity pronounced in flower; ovules 40–50. *Seeds* numerous, 2 mm long, 1.5 mm wide. *Disc* massive, 2–3 mm long, 2.5 mm wide, 2 mm thick, horizontal, oblong-rectangular in dorsal view, broadly attached at the base of the ovary.

*Phenology.* Collected in flower and fruit in November.

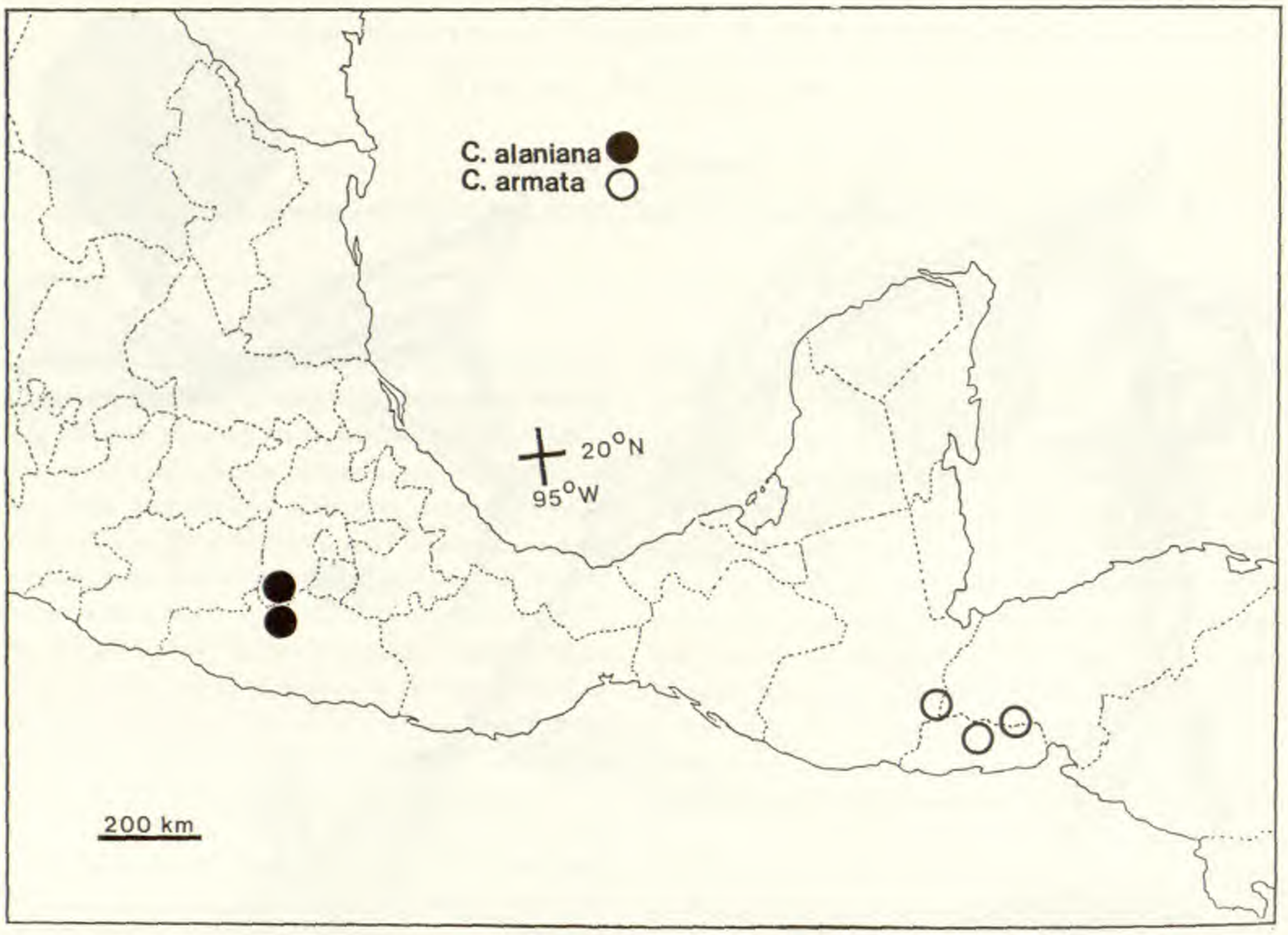


Figure 2. Distribution of *Cuphea alaniana* and *C. armata* in Mexico and Central America.

*Distribution and habitat* (Fig. 2). In southern México state and adjacent Guerrero; low spiny, deciduous woods, dry slopes, and sandy streamsides; 500–700 m.

*Etymology.* The species is named after Alan Graham, who has generously and ably assisted on field excursions many times since our first trip to Mexico for *Cuphea* in 1961.

The recognition of *Cuphea alaniana* adds a fourth species to subsection *Polyspermum* of section *Melvilla*. Species of the subsection are endemic to the western and southern mountains of Mexico. The subsection is characterized by spurless, deeply colored, thick-bodied floral tubes 20–32 mm long and ovules numbering 40–120. In *C. alaniana*, the reddish purple floral tube with two large erect, clawed dorsal petals, four small ventral petals, and a massive horizontal nectary termed the "disc" serve best to distinguish it from *C. micropetala* var. *hirtella* Koehne, to which it is surely most closely related. The latter differs in having six minute petals of equal size and a small disc. Both species share an unusual, dorsally gibbous ovary in addition to similar vegetative, trichome, and pollen morphology. Within the subsection, *C. alaniana* also resembles the poorly known *C. heteropetala* Koehne from Oaxaca by its slightly enlarged dorsal lobe and large petals, but *C. heteropetala* lacks a gibbous ovary and has a small, erect disc. Attempts to relocate *C. alaniana* in the states of México and Guerrero were unsuccessful. The type area, along the river near Temisco, Guerrero, is now occupied by dwellings and cultivated fields. Exploration further upstream in less disturbed sites also failed to locate the species. The paratype locality, directly north of Temisco in México, was not accessible by road in 1989, and was not visited by us.

*Paratypes.* MEXICO. **México:** Cerro de San Antonio, Tlatlaya, *Matuda 32110* (GH, MEXU).

**Cuphea armata** S. A. Graham, sp. nov. TYPE: El Salvador. Chalatenango: 4 km SSE of La Palma, pine forest, 950 m, 11 June 1970, *G. Davidse & R. Pohl 2073* (holotype, F; isotype, MO). Figure 1e.

Suffrutices, 0.5–1 m, caules erecti vel suberecti, pilis minutis albidis antrorsis adpressisque. Folia sessilia vel subsessilia, 20–50 mm longa, 5–12 mm lata ad medium caulis, ovata, oblonga, vel sublinearia, basi obtusa vel cordata, utrinque scabrella. Inflorescentia sat distincta, racemosa, interdum subcomposita; pedicelli gracili, 2–5 mm longi, persistentes; bracteolae 0.5 mm longae, lineari-lan-

ceolatae. Flores 12–15 mm longi, pallidi purpureo-rosei, basi puberuli saepe prominente bulboso-setosi, calcari 4 mm longo, distincte ascendente etiam conico; intus infra stamina bialatus, alae glabrae. Petala 6, 2 dorsalia intense violacea, majora, 7–9 mm longa; 4 ventralia minora 3–5 mm longa, pallide violacea. Stamina 11, 9 longiora exserta. Stylus demum exsertus; ovula 8–10. Semina 2 × 1.5 mm, oblonga, margine obtusa. Discus crassus, deflexus.

*Semi-shrubby* perennials, 0.5–1 m, erect or weakly erect and sprawling, irregularly branched from above the base, branches shorter than to longer than the main stem, bearing minute white, appressed, antrorse, sharp-pointed hairs and a longitudinal row of minute, falcate, antrorse hairs; internodes mostly equal to or shorter than the subtending leaves. *Leaves* sessile or subsessile, petioles 0–1 mm; blades at midstem 20–50 mm long, 5–12 mm wide, decreasing in size above and below the midstem, membranous, ovate, oblong, or sublinear, base rounded to cordate, apex acute to acuminate; surfaces finely scabrous, appearing glabrous, the hairs minute, appressed, the margins of the upper leaves and bracts ciliolate, bearing sparse bulbous-based setae, upper surface darker green than the lower; upper leaves gradually diminishing in size to become the bracts of the inflorescence. *Inflorescences* terminal bracteolate racemes or loose, short-branched thyrses; one flower interaxillary at a node, 1–3 additional flowers sometimes present on slender, alternate, axillary branchlets ca. 1 cm long; pedicels 2–5 mm, slender, persistent; bracteoles 0.5 mm, linear-lanceolate, persistent at the apex of the pedicel. *Floral tubes* 12–15 mm long, including an ascending, conical spur 4 mm long, the apex sometimes slightly descending, floral tubes dorsally concave, 1–2 mm wide at anthesis, in lateral view the base wider than the midportion, the neck not strongly contracted at anthesis, the mouth oblique, the ventral side extended 1 mm or less beyond the dorsal, the dorsal and adjacent lateral ribs diverging approximately 1 mm; outer surface pale rose-purple, darkest dorsally, puberulent with sparse but prominent red-purple, bulbous-based setae present on the dorsal and lateral ribs, especially toward the base of the tube, rarely individual flowers lacking setae, setae 0.5 mm long; inner surface lightly villous to glabrous above the stamens in a shallow ventral pouch, glabrous below, the alae glabrous; calyx lobes subequal, broadly triangular, 1.0 × 1.5 mm, margins of the dorsal lobe setulose-ciliolate, rarely glabrous, the others glabrous; appendages 0.5 mm long, terminating in a short bristle. *Petals* 6, unequal, the 2 dorsal largest, 7–9 mm long, oblong to nearly orbicular, not clawed, deep purple, held erect or reflexed slightly back over the dorsal side of the tube, subtended at the base by a triangular to corniculate, thickened scale free at the tip for 0.2 mm, the 4 ventral petals 3–5 mm, oblong to obovate, pale purple, held horizontally. *Stamens* 11, the 2 dorsalmost stamens shortest, included, 9 inserted at ca. 2–3 mm below the rim of the floral tube, exserted; filaments probably pale purple, glabrous; anthers purple. *Pollen* oval-triangular to nearly spherical, pores very slightly protruding; tricolporate, syncolpate; exine distinctly and uniformly striate, striae covering the surface of the grain, and possibly extending to the poles without disaggregation; diameter 18–20 μm in lactic acid. *Style* ultimately well-exserted; stigma punctiform; ovules 8–10. *Seeds* 2 × 1.5 mm, oblong, brown, margin thick, rounded. *Disc* 1 mm long, 0.5 mm wide at base of ovary, thick, triangular in outline, deflexed into the spur.

*Phenology.* Collected in flower and fruit in June, September, and December.

*Distribution and habitat* (Fig. 2). Southeastern Guatemala, Honduras, and El Salvador; pine forests; 900–1640 m.

*Etymology.* The specific epithet refers to the red-purple, bulbous setae that arm the floral tube and upper bracts of the inflorescence.

The species is placed in section *Diploptychia* by the presence of the key character of the section, the alae, two wings of tissue that extend from the base of the dorsalmost stamens in the floral tube to the base of the tube (Koehne, 1903). *Cuphea armata* bears close resemblance to *Cuphea pinetorum* Bentham and *C. avigera* Robinson & Seaton but differs from both by its unequal, bicolored petals. The prominent reddish, bulbous-based setae and pale purple floral tube further distinguish it from *C. pinetorum*, which has a white to rose, hirsute and pubescent floral tube. *Cuphea armata* resembles *C. avigera* especially by its conical, ascending spur, but lacks the glandular-viscous patches on the stems that distinguish *C. avigera*. Neither *C. pinetorum* nor *C. avigera* has been collected within the range of *C. armata*. Because agamospermy with accompanying infertile pollen is present in several species of the section, pollen of *C. armata* was tested for pollen viability. In cotton blue-lactic acid after 24 hours, 99% of all pollen stained deeply, indicating viable protoplasm. The pollen exine seems to lack the meshwork of striae at the poles that is typical of the pollen group to which *C. avigera* and *C. pinetorum* pollen types belong (Graham, in prep.), but this needs to be confirmed by SEM observations when more abundant material becomes available.

*Paratypes.* EL SALVADOR. **Chalatenango:** carretera

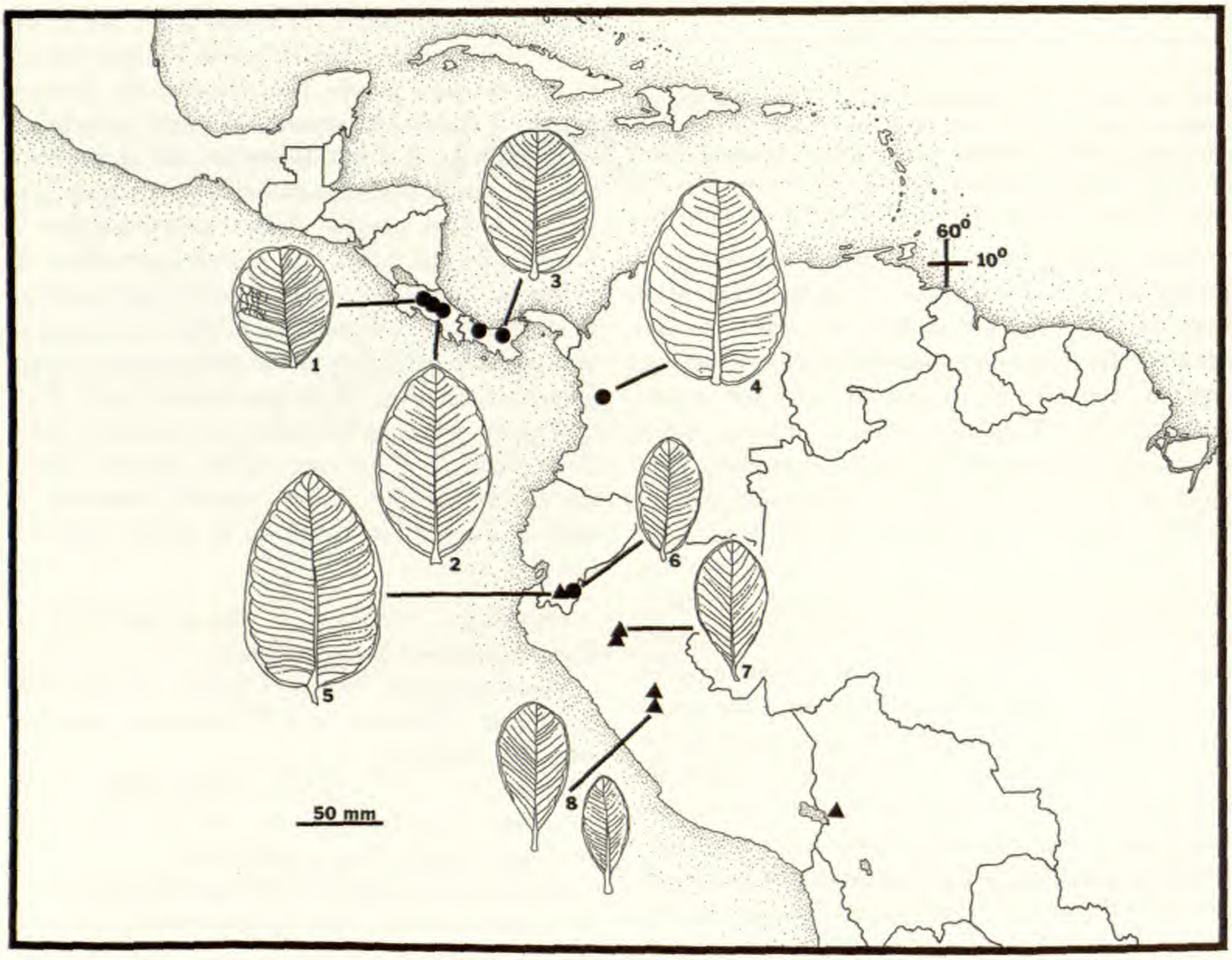


Figure 3. Distribution and variation in leaf shape, size, and petiole length in *Alzatea verticillata*. Examples 1–5 represent subspecies *amplifolia*, characterized by large, broad, oblong, sessile or subsessile leaves. Examples 6–8 represent subspecies *verticillata*, characterized by small, elliptical, oblong or obovate, distinctly petiolate leaves. Petioles on plants represented by examples 5 and 6 are approximately intermediate between the two subspecies. The major distinction remaining between the subspecies is leaf size, especially leaf width.

a La Palma, *Montalvo 3682* (MO); Río Nunuapa near La Palma, *R. Seiler 574* (F). GUATEMALA. **Chiquimula:** pine forest between Guatemala–Honduras border and Atulapa, *Molina R. & Molina 25260* (F, MO). HONDURAS. **Intibuca:** 12.7 mi. N of Marcala along the road from Marcala to La Esperanza, *Davidse et al. 35191* (MO).

## Note on Alzateaceae

The New World tropical family Alzateaceae is represented by the single species *Alzatea verticillata* Ruiz & Pavón. The species had been placed in eight families in five orders, including the Lythraceae, before its segregation to the monotypic family Alzateaceae (Graham, 1984). *Alzatea verticillata* was described first from the eastern side of the Peruvian Andes in 1798 (Ruiz & Pavón, Syst. Veg. Fl. Peruv. Chil. 1: 72). It was considered restricted to Bolivia and Peru until 1936, when it was collected in the low montane forests of Costa Rica. In 1978, it was discovered in the elfin cloud forest of Veraguas Province, Panama, and subsequently, in 1986, was found in Colombia on the Cerro del Torrá, Departamento del Chocó (Silverstone-Sopkin & Graham, 1986). The distribution of the species is now further enlarged by collections made by the late Alwyn Gentry on his last field expedition to Ecuador. Two collections, *Gentry 80008* and *80334* (MO), from the Cordillera del Cóndor, near the disputed Ecuador–Peru border in Morona-Santiago Province, represent the first record of the family in Ecuador, and tenuously establish its continuous distribution in mid- to low-montane forests along the eastern slopes of the mountains from Bolivia to Costa Rica (Fig. 3). The species is one of an estimated 26% of Ecuadorian species restricted to mid-elevations (900–3000 m) with widespread distribution in the Neotropics (Balslev, 1988).

The two Ecuadorian collections differ in leaf shape and size, and represent two subspecies. *Gentry 80334*, collected from an 18-m-tall tree at 2100 m, is typical of the elliptical to oblong or obovate,

petiolate, small-leaved subspecies *verticillata* from Peru and Bolivia (Fig. 3). *Gentry 80008*, collected from a 5-m-tall tree at 1350 m, has the broad, oblong, large leaves of subspecies *amplifolia*, until now known from Colombia, Panama, and Costa Rica. Both collections have short-petiolate leaves and are intermediate for this character between the distinctly petiolate-leaved subspecies *verticillata* and the sessile-leaved subspecies *amplifolia*. The distinctions between the subspecies, which were described before the species was known from Colombia or Ecuador (Graham, 1984), are diminished by the partial intermediacy of the Gentry collections. If future collections of *Alzatea* from northern Peru and Ecuador sample a fuller range of leaf shape and size, it should be easy to decide whether or not to continue recognition of these intraspecific taxa.

Leaves of *Gentry 80334*, among all collections of *Alzatea*, are the first to display apical leaf glands. The glands are similar to the hydathodes and extrafloral nectaries described for several other genera of the Myrtales (Ross & Suessenguth, 1926; Rao & Chakraborti, 1982; Turner & Lersten, 1983; Graham, 1984). The shiny, hardened secretion at the *Alzatea* leaf apex suggests the secretory product is a sugar solution and the gland is probably an extrafloral nectary.

*Specimens examined.* ECUADOR. **Morona-Santiago:** Gualaquiza Cantón, Cordillera del Cóndor, ridge top above Banderas, primary forest, 03°28′S, 78°22′W, primary forest, 17 July 1993, *A. Gentry 80008* (MO); Campamento Achupalla, 15 km E of Gualaquiza, 03°27′S, 78°22′W, dense tangled scrubby forest, 22 July 1993, *A. Gentry 80334* (MO).

*Acknowledgments.* I thank Ishmael Calzada for his energetic assistance in the field during our unsuccessful attempts to relocate *C. alaniana*. I am also grateful to Ronald Liesner, who first determined the *Alzatea* collections, and whose intimate knowledge of plant families has resulted in specialists everywhere receiving many interesting and important specimens that otherwise might have gone undetermined or unnoticed among exsiccatae. Wendy Mahon-Hils prepared the illustrations in Figure 1. This research was supported by NSF grant DEB 8806523.

Literature Cited

Balslev, H. 1988. Distribution patterns of Ecuadorean plant species. Taxon 37: 567–577.

Graham, S. A. 1984. Alzateaceae, a new family of Myrtales in the American tropics. Ann. Missouri Bot. Gard. 71: 757–779.

Koehne, E. 1903. Lythraceae. Pp. 1–326 *in* A. Engler (editor), Das Pflanzenreich, IV. 216. Heft 17. H. R. Engelmann, Leipzig.

Rao, T. A. & S. Chakraborti. 1982. A little looked at attribute of the leaves of *Sonneratia caseolaris* (L.). Curr. Sci. 51: 303–305.

Ross, H. & K. Suessenguth. 1926. Das Apikalorgan der Blätter von *Lafoensia*. Flora 120: 1–18.

Silverstone-Sopkin, P. A. & S. A. Graham. 1986. Alzateaceae, a plant family new to Colombia. Brittonia 38: 340–343.

Turner, G. W. & N. R. Lersten. 1983. Apical foliar nectary of pomegranate (*Punica granatum*: Punicaceae). Amer. J. Bot. 70: 475–480.

# *Muhlenbergia aguascalientensis* (Poaceae: Chloridoideae: Eragrostideae), a New Species from Mexico

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ABSTRACT. *Muhlenbergia aguascalientensis*, from Sierra Fría, Aguascalientes, Mexico, is described and illustrated. A tabular comparison with its related species, *M. durangensis* Herrera and *M. michisensis* Herrera & Peterson, is given.

The genus *Muhlenbergia* Schreber (Poaceae, Chloridoideae) is comprised of over 160 species (Clayton & Renvoize, 1986), most of which are distributed in North and South America. In the southwestern United States and northern Mexico, species of *Muhlenbergia* make up about 25% of the grassland flora and provide a considerable amount of forage for livestock (Cronquist et al., 1977). The majority of species are xeromorphic, and a large percentage of the Mexican species are endemic (44% of the *M. montana* (Nuttall) Hitchcock complex; Herrera-Arrieta & Grant, 1993). A distinct taxon belonging to this complex was found during an examination of herbarium specimens at HUAA to complete the monographic descriptions of the *Muhlenbergia montana* complex, and to make a floristic study of the grasses from Aguascalientes. Additional field collections were made in the Sierra Fría, Aguascalientes, Mexico, where the species was first collected. The new species is named after this region.

**Muhlenbergia aguascalientensis** Herrera & De la Cerda, sp. nov. TYPE: Mexico. Aguascalientes: Mpio. de San José de Gracia, NW of Aguascalientes, 12 km NW from La Congoja, Playa Mariquitas, Monte Grande de la Sierra Fría, 2850 m, 22°15′6.7″N, 102°37′24.9″W, 8 Nov. 1986, *G. García 2801* (holotype, HUAA; isotypes, CIIDIR, ENCB, IEB). Figure 1.

A *Muhlenbergia michisensis* culmis 30–58 cm altis, ligulis 0.5–0.7(–1) mm longis, auriculis 1–2(–6) mm longis; laminis basalis 5–10(–15) cm longis; paniculis 5–8(–15) cm longis; spiculis 5–6.5 mm longis; aristis 2–3.5 cm longis; antheris 2.4–3 mm longis differt.

Caespitose perennial, rhizomatous, 30–58 cm tall. Sheaths up to 1.5 cm long, glabrous to scaberulous, striate, shorter than the internodes, with hyaline margins, elongated toward the blade forming auricles 1–2(–6) mm long. Ligules 0.5–0.7(–1) mm long, membranous, hyaline, fimbriate, rounded. Basal blades 5–10(–15) cm long, 1–2.5 mm wide, scaberulous, flat to folded, the margins and central rib sclerosed, scabrous. Panicles 5–8(–15) cm long, 2–4 cm wide, open, loosely flowered, pyramidal, largely exserted, olive, the ascending branches appressed to spreading at maturity, 20–40° from the culm axis, 2–5 cm long; pedicels 1–2.5 mm long, scabrous; inflorescence branches 2–5 cm long; central axis 8-ribbed at the base of the panicle, scabrous. Spikelets 5–6.5 mm long, erect, 1-flowered. Glumes 5–6.5 mm long, oblanceolate, entire, longer than the lemma, usually equal in length, the apex sharply apiculate to mucronate, the mucron 0.5–1 mm long, 1-nerved, olivaceous; second glume with the 2 lateral nerves inconspicuous, scabrous along the entire length. Lemma 4.5–5 mm long, oblong-lanceolate, hyaline to yellowish, awned, glabrous to shortly pilose on the lateral nerves at base; apex acute, minutely bifid, the lobes to 0.2 mm long; awn 2–3.5 cm long, flexuous, yellowish. Palea 4.2–4.8 mm long, oblanceolate, entire, glabrous to pilose on the nerves at the base. Anthers 2.4–3 mm long, purplish. Caryopsis not seen. Chromosome number $2n = 20$.

*Distribution and habitat.* *Muhlenbergia aguascalientensis* is known from northwestern Aguascalientes, northwest of La Congoja, San José de Gracia, at 2850 m. It occurs in grassland in open forest of *Juniperus deppeana* Steudel and *Quercus sideroxyla* Humboldt & Bonpland.

*Muhlenbergia aguascalientensis* resembles *M.*

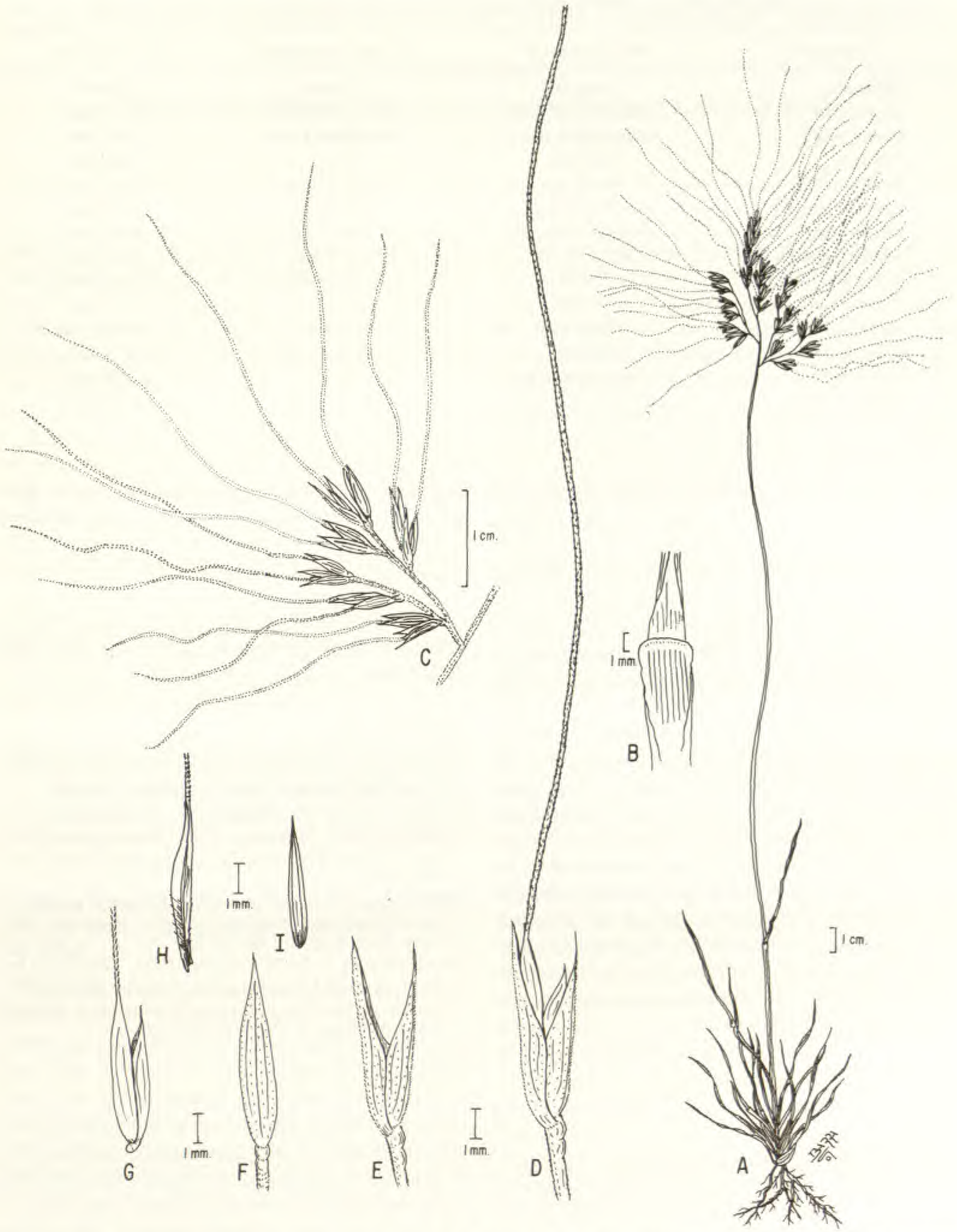


Figure 1. *Muhlenbergia aguascalientensis* Herrera & De la Cerda (*G. García 2801*). —A. Habit. —B. Ligule. —C. Inflorescence branch. —D. Spikelet. —E. Glumes. —F. Lower glume, dorsal view. —G. Floret. —H. Lemma, lateral view. —I. Palea, dorsal view.

Table 1. Characters distinguishing *Muhlenbergia aguascalientensis*, *M. durangensis*, and *M. michisensis*.

| Characters | *M. durangensis* | *M. aguascalientensis* | *M. michisensis* |
|---|---|---|---|
| Rhizomes | Present | Present | Absent |
| Ligule apex | Truncate-fimbriate | Truncate-fimbriate | Acuminate |
| Ligule length | 0.5–0.7(–1) mm | 0.5–0.7(–1) mm | 4–7 mm |
| Leaves | Caulinar | Basal | Caulinar |
| Panicle length | 10–25 cm | 5–8(–15) cm | 12–17 cm |
| Spikelet length | 6–7(–7.5) mm | 5–6.5 mm | 4.5–5 mm |
| Glume length | (5–)6–7(–7.5) mm | 5–6.5 mm | 4.5–5 mm |
| Lemma length | 5–6.7(–7) mm | 4.5–5 mm | 3.5–4 mm |
| Lemma apex | Entire | Minutely bifid | Minutely bifid |
| Lemma lobes length | 0.0 mm | 0.2 mm | 0.2 mm |
| Lemma awn length | 15–20 mm | 20–35 mm | 12–13 mm |
| Palea length | 5–6 mm | 4.2–4.8 mm | 2.8–3.5 mm |
| Palea apex | Entire-apiculate | Entire | Bilobed |
| Anther length | (2.5–)3–3.5 mm | 2.4–3 mm | 2–2.4 mm |

*michisensis* Herrera & Peterson and *M. durangensis* Herrera; however, these two species differ in many morphological characteristics (Table 1). *Muhlenbergia aguascalientensis* is similar to *M. flaviseta* Scribner, a species of restricted distribution in the Sierra Madre Occidental, sharing with it macromorphological features such as basal leaves and a long-exserted panicle, but differing in most of the spikelet features.

The flavonoid chemistry of *M. aguascalientensis* is very similar to *M. eriophylla* Swallen and *M. michisensis* Herrera & Peterson. They share: quercetin 3-0 rhamnosilxyloside, luteolin 6 galactoside, luteolin 6 glucoside, luteolin 8 glucoside, apigenin 7-0 arabinoside, apigenin 7-0 diarabinoside, apigenin 7-0 glucoside, tricin 5-0 glucoside, tricin 7-0 glucuronide, and 4′hydroxyflavone 7-0 glucoside (Herrera & Bain, 1991). *Muhlenbergia aguascalientensis* also contains luteolin 6 xylosilglucoside, which was previously thought to be a unique compound of *M. durangensis*.

*Paratypes.* MEXICO. **Aguascalientes:** Playa Mariquitas, Sierra Fría, 12 km NW from La Congoja, San José de Gracia, 22°15′6.7″N, 102°37′24.9″W, 2850 m, 25 Nov. 1993, *Herrera & De la Cerda 1185* (CIIDIR, HUAA, IEB, ENCB, MEXU, US).

*Acknowledgments.* This study was partially supported by the Banco de México, COFAA-IPN and UAA.

Literature Cited

Clayton, W. D. & S. A. Renvoize. 1986. Genera Graminum, Grasses of the World. Kew Bull., Addit. Ser. XIII: 1–389. Her Majesty's Stationery Office, London.

Cronquist, A., A. H. Holmgren, N. H. Holmgren, J. L. Reveal & P. K. Holmgren. 1977. Intermountain Flora. Vol. 6, The Monocotyledons. Columbia Univ. Press, New York.

Herrera A., Y. & J. F. Bain. 1991. Flavonoid profiles in the *Muhlenbergia montana* complex (Poaceae). Biochem. Syst. Ecol. 19: 665–672.

Herrera-Arrieta, Y. & W. F. Grant. 1993. Correlation between generated morphological character data and flavonoid content of species in the *Muhlenbergia montana* complex. Canad. J. Bot. 71: 816–826.

# New Taxa and Combinations in the Tribe Juanulloeae (Solanaceae)

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ABSTRACT. A new species of *Trianaea* from eastern Ecuador, *T. naeka*, is described and illustrated. Several new combinations in the genera *Trianaea*, *Schultesianthus*, and *Juanulloa* are made in preparation of a larger work on the phylogeny of the tribe Juanulloeae.

A recent phylogenetic study of the tribe Juanulloeae (Persson et al., 1994) has necessitated several new combinations in the genera *Trianaea*, *Schultesianthus*, and *Juanulloa*. These nomenclatural changes are made here in preparation for a conspectus of the tribe and a more ample discussion of relationships within the groups. In addition to the nomenclatural changes identified, several new taxa were discovered, one of which is described here. Other new taxa will be described as more material becomes available.

**Trianaea naeka** S. Knapp, sp. nov. TYPE: Ecuador. Morona Santiago: Colinas, above the Misión Salesiana-Shuar, 800–1000 m, 3°25′S, 78°35′W, 6 Nov. 1986, *Neill & Cerón 7449* (holotype, MO; isotypes, NY, QCNE). Figure 1.

Species *Trianaeae nobili* Planchon & Linden similis, sed foliis linearis pubescentibus, inflorescentiis unifloribus differt.

Epiphytic shrub or liana at forest edge; stems densely hirsute, the trichomes 4–5 mm long, consisting of a simple, 2–4-celled, uniseriate tip arising from a multicellular, multiseriate, pustular base, the apex minutely glandular, golden brown, the uniseriate tips of the trichomes often deciduous, leaving the pustulate base; bark of older stems pale tan, loose and somewhat exfoliating. Leaves 0.4–1 × 5–10 cm, linear, coriaceous, drying dark olive green, the venation obscure, ca. 8–10 primary veins, densely hirsute with simple, uniseriate, minutely glandular trichomes like those of the stems, but lacking the pustular bases, arising directly from the epidermis, the base attenuate, the margins revolute, the apex acuminate; petiole 5–8 mm, somewhat winged from the attenuate leaf base, drying dark brown. Inflorescence terminal, consisting of a single flower. Buds not known. Pedicel at anthesis 18–20 cm long and flexuous, 2 mm diam. at the base, ca. 10 mm diam. at the apex, densely pubescent with simple uniseriate 2–4-celled trichomes, the trichomes 4–5 mm, less rigid than those of the stems, lacking pustulate bases. Flowers with the calyx tube 1.5–2 cm, conical, the lobes 4–5 cm, triangular, pubescent with simple uniseriate trichomes like those of the pedicel, sparsely pubescent within; corolla campanulate, greenish brown or purplish ("clear lila" fide *van der Werff & Gudiño 11246*), the tube flaring, ca. 5 cm long, the lobes rounded, 1.5–2 cm long, reflexed at anthesis, sparsely pubescent with trichomes like the calyx, the trichomes weak and crumpling; stamens with the filaments ca. 3.5 cm, inserted in the basal ⅓ of the corolla tube, the anthers ca. 7 × 3 mm, ventrifixed; ovary glabrous, the style 5.5–6 cm long, glabrous, the stigma globose, ca. 5 mm diam., papillose. Fruit and seeds not known.

*Distribution.* Known only from wet premontane rainforest in eastern Ecuador, from 800 to 1000 m elevation.

*Trianaea naeka* is a striking plant and cannot be confused with any other species of *Trianaea*, or with any other species of epiphytic Solanaceae. The narrowly linear, densely pubescent leaves are found nowhere else in the tribe. Pollen morphology is of the *Trianaea nobilis* type (Persson et al., 1994), where the exine ornamentation is reticulate at the equator and at the poles but the muri are not joined in the mesocolpium to form a tectum.

The specific epithet, naeka, is the Shuar name (given by Antonio Wampash, Shuar informant) for this plant.

*Paratype.* ECUADOR. **Morona Santiago:** along new road Mendez-Morona, km 30–35, 800 m, 19 Aug. 1989, *van der Werff & Gudiño 11246* (QCNE).

**Trianaea brevipes** (Cuatrecasas) S. Knapp, comb. et stat. nov. Basionym: *Trianaea spectabilis* Cuatrecasas var. *brevipes*, J. Wash. Acad. Sci. 49: 271. 1959. TYPE: Colombia. Cundinamarca: Monterredondo between Guaybetal and Limoncito, Cordillera Oriental, forests, 1800–2100 m, 6 July 1955, *Vogel 6* (holotype, US; isotype, M).

Figure 1. Holotype of *Trianaea naeka* S. Knapp (*Neill & Cerón 7449*, MO).

**Schultesianthus venosus** (Standley & C. V. Morton) S. Knapp, comb. nov. Basionym: *Markea venosa* Standley & C. V. Morton, Publ. Field Mus. Nat. Hist., Bot. 18: 1065. 1938. TYPE: Costa Rica. Alajuela: Vara Blanca de Sarapiquí, 1770 m, Oct. 1937, *Skutch 3355* (holotype, US 1643419).

**Schultesianthus crosbianus** (D'Arcy) S. Knapp, comb. nov. Basionym: *Markea crosbiana* D'Arcy, Ann. Missouri Bot. Gard. 60: 654. 1973 [1974]. TYPE: Panama. Chiriquí: Cerro Horqueta NW of Boquete, 5000–5800 ft., *Dwyer et al. 430* (holotype, MO).

**Schultesianthus uniflorus** (Lundell) S. Knapp, comb. nov. Basionym: *Markea uniflora* Lundell, Phytologia 1: 340. 1939. TYPE: Mexico. Chiapas: Volcán Tacana, 2800 m, 27 Mar. 1939, *Matuda 2816* (holotype, MICH; isotypes, MEXU, MO).

**Juanulloa wardiana** (D'Arcy) S. Knapp, comb. nov. Basionym: *Rahowardiana wardiana* D'Arcy, Ann. Missouri Bot. Gard. 60: 671. 1973 [1974]. TYPE: Panama. Coclé: beyond La Mesa towards El Llano and the Panamá/Coclé border N of El Valle de Antón, 800–860 m, *Luteyn 3150* (holotype, DUKE, isotype, MO).

**Juanulloa globifera** (S. Knapp & D'Arcy) S. Knapp, comb. nov. Basionym: *Rahowardiana globifera* S. Knapp & D'Arcy, Novon 3: 429. 1993. TYPE: Colombia. Antioquia: Parque Nacional Natural "Las Orquideas," Sector Venados, 890 m, 6°33′N, 76°19′W, 1 Apr. 1988, *Cogollo et al. 2895* (holotype, JAUM-018167; isotypes, COL, FMB, JAUM, MO).

*Acknowledgments.* I thank Viveca Persson and Steve Blackmore, my coworkers on pollen morphology of Solanaceae; Roy Vickery and the curators of the herbaria mentioned in the text for help with the loan of specimens; Tamara Nuñez and David Neill for asistance at QCNE; and the Photographic Unit of the Natural History Museum for the photographic plate.

Literature Cited

Persson, V., S. Knapp & S. Blackmore. 1994. Pollen morphology and systematics of tribe Juanulloeae A. T. Hunziker (Solanaceae). Rev. Palaeobot. Palynol. 83: 1–30.

# A New Species of *Sicydium* Schlechtendal (Cucurbitaceae: Zanonioideae, Zanonieae, Sicydiinae) for the *Flora Mesoamericana*

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ABSTRACT. *Sicydium daviliae,* from the region of Ocozocuautla, Chiapas, Mexico, is described as new. It can be distinguished from the other species in the genus by the presence of a soft and dense pubescence composed of long, multicellular, non-glandular hairs covering stems, blade surfaces, petioles and tendrils, by filaments 2–3 times longer than anthers, by petal margins entire, and by staminate pedicels articulate at the middle or further up.

RESUMEN. Se describe como nueva especie a *Sicydium daviliae,* de la región de Ocozocuautla, Chiapas, México. Esta nueva especie se distingue de las otras especies del género por la pubescencia densa y suave, compuesta de tricomas largos, multicelulares y no glandulares, la cual cubre los tallos, ambas superficies de la lámina, los peciolos y los zarcillos, así como también por presentar filamentos 2–3 veces más largos que las anteras, pétalos con los márgenes enteros y pedicelos estaminados articulados en la mitad o poco más arriba.

As a result of examination of herbarium specimens for the treatment of *Sicydium* for *Flora Mesoamericana,* one specimen was found whose stamen and vestiture features set it apart as a new species, described below.

**Sicydium daviliae** Lira, sp. nov. TYPE: Mexico. Chiapas: Mpio. Ocozocuautla, Camino Horizonte a Santa Laura, 12 June 1983, *F. Vázquez B. 1024* (male plant) (holotype, XAL). Figure 1.

*Sicydio tamnifolio* (HBK) Cogniaux similis, sed differt staminum filamentis quam antheris 2–3 plo longioribus, foliorum, caulium, petiolorumque indumento densiore, trichomatibus longis apice non glandularibus constato, petalorum marginibus integris, florum masculorum pedicellis in parte media vel altiore articulatis.

Herbaceous vine, perennial, dioecious, drying yellowish green; stems, petioles, upper and lower surfaces, and tendrils densely pubescent to tomentose, with long (1–2 mm), soft multicellular, non-glandular hairs. Stems angulate-sulcate. Petioles angulate-sulcate, 1–1.5(–2) cm long; blades subcoriaceous, ovate-cordate, 3.5–5.5 cm long, 3–5 cm broad, entire, apex acute to shortly acuminate, margins entire to slightly undulate-dentate, basal sinus cordate. Tendrils simple. Flowers small, arranged in loose panicles. Staminate panicles 4–6 cm long, the branches commonly with a reduced leaf in the axils; pedicels filiform, 1–1.3 mm long, articulate at the middle or a little above the middle, subtended by a lanceolate reduced leaf; receptacle disk-shaped, less than 0.2 mm long, 1–1.2 mm wide, puberulent; sepals 5, triangular, ca. 0.6 mm long, 0.3 mm wide, puberulent; petals 5, ovate-lanceolate, spreading, greenish cream or greenish white, 1–1.3 mm long, 0.5–0.6 mm wide, puberulent, the margins entire; stamens 3, totally free, two with bithecial anthers, one with a monothecial anther; filaments inserted in the base of the receptacle, 0.4–0.6 mm long, slightly bent inward, forked toward the apex in the stamens with bithecial anthers; anthers oblong-elliptic, 0.2–0.3 mm long, opening by a longitudinal suture. Plants with pistillate flowers and fruits unknown.

*Sicydium daviliae* is known only from the type, collected in the Municipio Ocozocuautla, Chiapas, Mexico, growing in disturbed tropical rainforest at 900 m, on sandy, clayish, and rocky soils.

The approximately eight species of *Sicydium* are distributed in the Neotropics. They have been traditionally distinguished mainly on the basis of stamen structure, and presence/absence and distribution of vestiture (Cogniaux, 1881, 1916; Dieterle, 1976; Jeffrey & Trujillo, 1992; Nee, 1993; Schlechtendal, 1832; Wunderlin, 1978). So far, three species were found in Mexico–Mesoamerica: *S. tamnifolium* (HBK) Cogniaux, a species ranging from central Mexico to South America, and *S. tuerckheimii* J. Donell-Smith and *S. schiedeanum* Schlechtendal (= *S. glabrum* Standley & Steyermark), both ranging at least from southern Mexico to Central America.

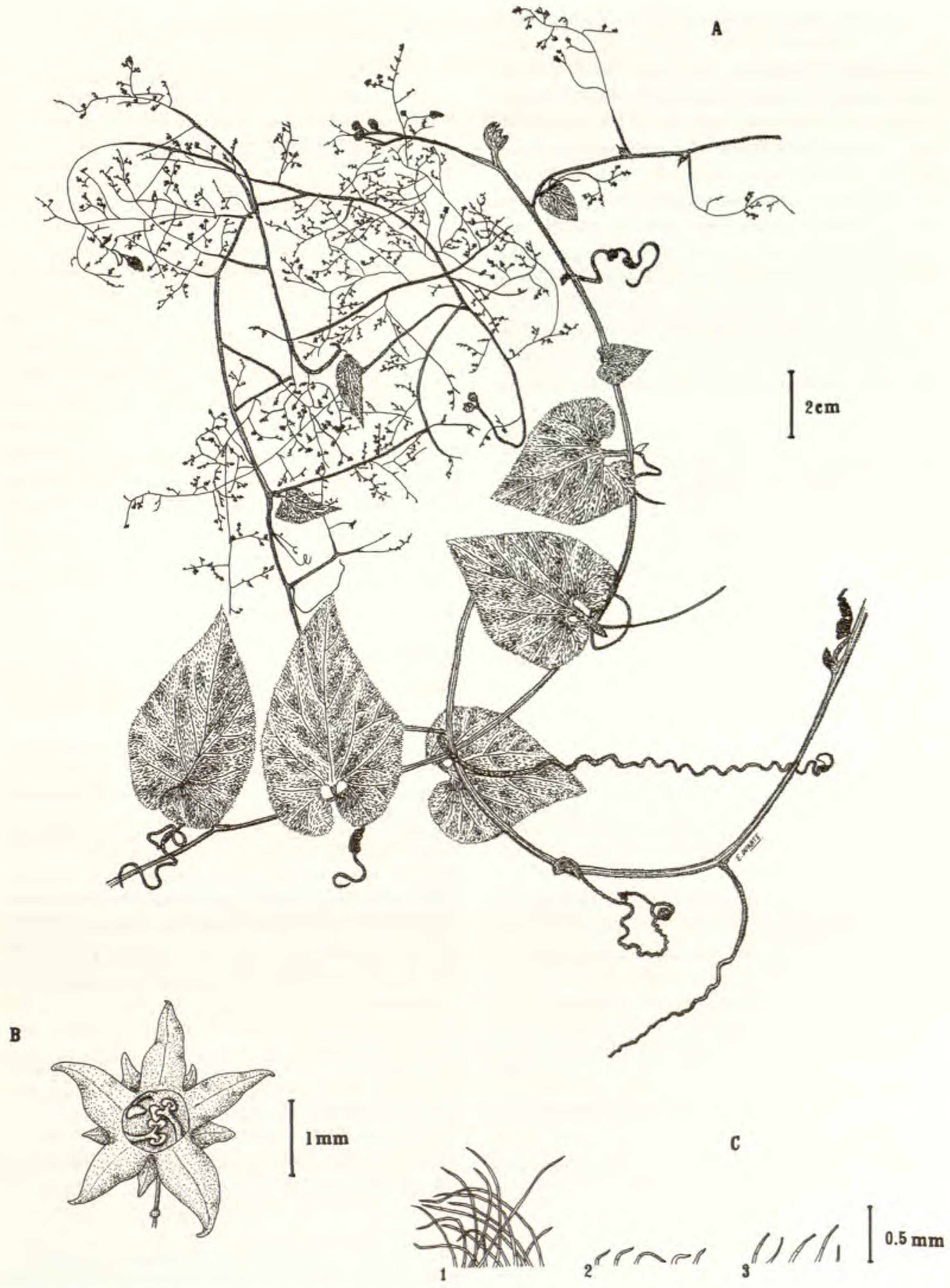


Figure 1. *Sicydium daviliae* Lira. —A. Habit. —B. Staminate flower. —C. Comparison among the trichomes present on the leaves of *S. daviliae* (1), *S. tuerckheimii* (2), and *S. tamnifolium* (3). Based on type specimen *F. Vázquez B. 1024* (XAL).

*Sicydium daviliae* can readily be distinguished from the above-mentioned species by its unique combination of stamens with filaments 2–3 times longer than the anthers; petals with entire margins; a dense, soft indument made up of long, multicellular, nonglandular hairs; and staminate pedicels that are articulate at or above the middle. In contrast, *Sicydium tamnifolium* includes populations with leaf blades, stems, and petioles densely and softly pubescent, but the pubescence is less dense and the hairs are much shorter and gland-tipped. In addition, the stamens of *S. tamnifolium* have very short or obsolete filaments, the petal margins are somewhat fimbriate or laciniate, and the pedicels of the staminate flowers are articulate near the base.

A species with a similar vestiture to that of *Sicydium daviliae* is *S. araguense* Steyermark & Trujillo from Venezuela (Jeffrey & Trujillo, 1992). However, in *S. araguense* the stems are only puberulent with age, in adult leaves the pubescence is not as dense or soft, and the leaf blades are narrowly lanceolate and longer. The new species is named to honor Patricia Dávila, Mexican agrostologist.

A Key to the Mexican/Mesoamerican Species of *Sicydium*

1a. Plants essentially glabrous or only slightly puberulent; leaves always unlobed, usually lustrous in both surfaces; filaments 2–2.5 times longer than anthers . . . . . *S. schiedeanum* Schlechtendal
1b. Plants conspicuously soft-puberulent, pubescent, or tomentose at least on the lower surface of the leaves; leaves unlobed to angulate or slightly lobate, not lustrous; filaments obsolete to 3 times longer than anthers.
2a. Leaves puberulent and rough-scabrous on the upper surface, densely and softly pubescent on the lower surface, the pubescence commonly dark reddish brown when dry; filaments 2–3 times longer than anthers . . . . . *S. tuerckheimii* J. Donell-Smith
2b. Leaves pubescent, puberulent to tomentose on both surfaces, the pubescence yellowish or whitish in dry specimens; filaments obsolete to 2–3 times longer than anthers.
3a. Plants puberulent to villous, the vestiture mainly of glandular hairs; filaments obsolete; margins of the petals slightly fimbriate or laciniate; pedicels of the staminate flowers articulate near the base . . . . *S. tamnifolium* (HBK) Cogniaux
3b. Plants densely and softly pubescent to tomentose, the vestiture mainly of nonglandular hairs; filaments 2–3 times longer than anthers; margins of the petals entire; pedicels of the staminate flowers articulate in the middle or slightly above . . . . . *S. daviliae* Lira

*Acknowledgments.* I thank the curators of BM, BR, CHAPA, ENCB, F, HUH, K, LL, MICH, MO, NY, P, TEX, US, and XAL for allowing me to review collections of *Sicydium*, especially Sergio Avendaño (XAL) for making available the specimen on which the description of the new species is based. Eloisa Duarte prepared the excellent drawings, and David Sutton (BM), Fernando Chiang, and two anonymous reviewers commented critically on the manuscript; Fernando Chiang also prepared the English version of the paper, as well as the Latin diagnosis.

Literature Cited

Cogniaux, A. 1881. Cucurbitacées. Pp. 325–951 *in* A. de Candolle & C. de Candolle (editors), Monographiae Phanerogamarum. G. Masson, Paris.

———. 1916. Cucurbitaceae–Fevilleae et Melothrieae. Pp. 1–277 *in* A. Engler (editor), Das Pflanzenreich. Regni Vegetabilis Conspectus. Verlag von Wilhelm Engelmann, Leipzig.

Dieterle, J. V. A. 1976. Cucurbitaceae. *In:* Flora of Guatemala. Part XI. Fieldiana Bot. 24: 306–395.

Jeffrey, C. & B. Trujillo. 1992. Cucurbitaceae. Pp. 11–201 *in* G. Morillo (editor), Flora de Venezuela. Fondo Editorial Acta Científica Venezolana, Caracas, Venezuela.

Nee, M. 1993. Cucurbitaceae. *In:* V. Sosa (editor), Flora de Veracruz. Fascículo 74. Instituto de Ecología A.C./ University of Riverside, Xalapa, Veracruz.

Schlechtendal, D. F. L. 1832. De Plantis Mexicanis. Linnaea 7: 380–400.

Wunderlin, R. P. 1978. Cucurbitaceae. *In:* R. E. Woodson, Jr. & R. W. Schery (editors), Flora of Panama. Part IX. Ann. Missouri Bot. Gard. 65: 285–366.

# *Conceveiba parvifolia* (Euphorbiaceae), a New Species from Panama and Colombia

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ABSTRACT. *Conceveiba parvifolia* from Darién, Panama, and Antioquia, Colombia, is described and illustrated.

Two wind-thrown trees encountered on the forested slopes above the abandoned Cana gold mine in Darién are apparently the first known representatives of the genus *Conceveiba* Aublet from Panama, although the genus was previously known from both neighboring Costa Rica and Colombia. Specimens from these two trees key readily to the subtribe Conceveibinae of the Alchorneae (Acalyphoideae) in Webster's synopsis (1994). Within that subtribe, however, the Panamanian collections combine characters currently used to distinguish *Conceveiba* and *Gavarretia* Baillon, i.e., on the one hand the sepals of the pistillate flower are separate (usually), the style branches blunt, and the anthers muticous (as in *Conceveiba*), while on the other hand the sepals of the pistillate flower are eglandular, and the ovary is 2-locular (as in *Gavarretia*, although some species of *Conceveiba* are similarly eglandular). The generic boundaries were not clear in this subtribe even before this intermediate taxon further blurred them, and I have chosen to name the new species in *Conceveiba* since I agree with Webster (1994) that Mueller's inclusion (1874) of *Gavarretia* as a section of *Conceveiba* may be justified.

**Conceveiba parvifolia** McPherson, sp. nov. TYPE: Panama. Darién: near Cana mine S of El Real (Cerro Pirré massif), 7°45′N, 77°40′W, ca. 900 m, 26 Aug. 1987, *McPherson 11607* (holotype, PMA; isotypes, BM, COL, CR, DAV, EAP, F, G, GH, HUA, K, MEXU, MICH, MO, NY, P, US). Figure 1.

Species foliis minoribus (2.7–16.5 cm × 0.8–5.5 cm), inflorescentiis masculis brevibus (10 cm) fere eglandulatis, floribus masculis non fasciculatis, sepalis floris feminei 4(–5) eglandulatis, ovario biloculari, stylis 2 semiconnatis a congeneribus diversa.

Tree (6–)15–20 m; colored exudate absent; youngest branches stellate-puberulent, without lenticels, terete or somewhat ridged, the older ones glabrate and bearing elongated lenticels. Leaf blade (2.7–)3.5–8.0(–16.5) cm long, (0.8–)1.8–4.0(–5.5) cm wide, elliptical-oblong, obtuse at the base, acuminate at the apex, the margin crenate (sometimes obscurely so) with 5–8 mucronate teeth, the upper surface sparsely stellate-puberulent before maturity, rapidly glabrate, the lower surface densely stellate-puberulent before maturity, eventually glabrate, often with 1–several embedded glands, secondary veins 6–10 on each side of the midrib, the reticulum slightly raised on the upper surface and more strongly raised on the lower; petiole 1.3–4.0(–4.8) cm long, 0.5–1.0 mm diam., semicircular in cross section, sparsely stellate-puberulent, a distal pulvinus usually discolored and thereby distinguishable, 2–3 mm long, sometimes slightly swollen, a smaller proximal pulvinus often present; stipules subulate, 2–4 mm long, up to 0.5 mm wide, stellate-puberulent, quickly caducous. Plants dioecious; inflorescences terminal or from the axils of the most distal leaves. Staminate inflorescences paniculate or less often racemose, up to 10 cm long, the axes stellate-puberulent, bracts triangular, up to 2 mm long, stellate-puberulent, each bract often accompanied by two smaller bracteoles, both bracts and bracteoles sometimes bearing weakly differentiated glabrous glandular patches; pedicels 1–1.5 mm, not fasciculate, glabrous; buds ca. 2 mm diam., apiculate; sepals valvate, 2 or 3 in number, 2.5–3.5 mm long, up to 3 mm wide, concave, eglandular, green, glabrous without, somewhat granular-puberulent within at base of filaments; petals and disk absent; stamens 35–42, filaments up to 3 mm long, free or the central ones connate basally, glabrous, anthers ca. 0.8 mm long, rounded, somewhat puberulent; pistillode absent. Pistillate inflorescences racemose, up to 5 cm long (occasionally the most proximal flowers subtended by only slightly modified leaves), the axes stellate-puberulent, eglandular; bracts not seen, rapidly caducous; pedicels 4–13(–18) mm long, somewhat inflated distally, stellate-puberulent, usually bearing two bracteoles ca. 2 mm long, these caducous, usually attached near the pedicel base but sometimes attached subapically and then mistakable for sepals;

Figure 1. *Conceveiba parvifolia* McPherson. —A. Twig bearing staminate inflorescences. —B. Portion of staminate inflorescence. —C. Staminate flower. —D. Pistillate inflorescence. —E. Pistillate flower with 4 sepals and a bracteole. (A–C based on *McPherson 11621*; D, E based on *McPherson 11607*.)

sepals 4(–5) in number, 2–5 mm long, subulate, free or occasionally two of them partially connate, eglandular, pale green, stellate-puberulent; petals, disk, and staminodes absent; pistil 6–9 mm long, stellate-puberulent, ovary ca. 3 mm long, 2-locular; styles 2 in number, fused basally into a column 1.5–3 mm long, free and bifid distally, these free portions stigmatic adaxially and ca. 3 mm long in total, the ultimate branches ca. 2 mm long, blunt-tipped; ovules 1 per locule. Fruit unknown.

From the seven or eight other members of its genus and from the monotypic *Gavarretia*, *Conceveiba parvifolia* can be separated by its smaller leaves, shorter and only obscurely glandular staminate inflorescences, non-fasciculate staminate flowers, and pistillate flower with 4(–5) eglandular sepals, a bilocular ovary, and 2 styles connate half their length.

At the suggestion of Grady L. Webster, I examined two additional specimens that proved to belong to the new species. These collections, made by R. Callejas, F. J. Roldán, and J. Betancur of HUA, extend the distribution of *Conceveiba parvifolia* from easternmost Central America well into the northwestern corner of South America.

*Paratypes.* PANAMA. **Darién:** near Cana mine S of El Real (Cerro Pirré massif), 7°45′N, 77°40′W, ca. 900 m, 26 Aug. 1987, *McPherson 11621* (BM, COL, CR, DAV, F, HUA, K, MEXU, MICH, MO, NY, PMA, US). COLOMBIA. **Antioquia:** Municipio Anorí, via Dos Bocas-Providencia, 7°26′N, 74°56′W, 100–120 m, 9 jul. 1987, *Callejas et al. 4477* (MO); Municipio Remedios, 10–12 km NW de Remedios en la via a Zaragoza, 7°05′N, 74°15′W, 300 m, 16 sep. 1987, *Callejas et al. 5261* (MO).

*Acknowledgments.* I thank David Olson, who accompanied me to Cana to collect ants, and John Myers, who drew the illustration.

Literature Cited

Mueller, J. 1874. Euphorbiaceae [part 2]. Pp. 293–750 *in* Martius, Flora Brasiliensis, Vol. 11. Cramer, Weinheim.

Webster, G. L. 1994. Synopsis of the genera and suprageneric taxa of Euphorbiaceae. Ann. Missouri Bot. Gard. 81: 33–144.

# A New *Votomita* (Melastomataceae) from Panama

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ABSTRACT. A new species of *Votomita, V. cupuliformis,* has been found on the north side of western Panama, the first member of the genus known to occur in Central America. The new species is most similar to *V. roraimensis* Morley of central Roraima, Brazil. Distinguishing features are discussed, and a key to all nine species of the genus is provided.

**Votomita cupuliformis** Morley & Almeda, sp. nov. TYPE: Panama. Bocas del Toro: Laguna de Chiriqui, rincon Sur-Este Nuri, campamento cerca pequeña poblacion Guaymi, 15 km Oeste de Punta Cricamola, entrando Ensenada de Catavela, y subiendo Quebrada Nuri, 8°55′N, 81°49′W, unos 5 km al Sur del campamento, 10–25 m, 18 mar. 1993, *Robin Foster, A. Herre, E. Kalko & C. Handley 14563* (holotype, CAS; isotypes, MO, PMA, SCZ, US). Figures 1, 2.

Arbor glabra usque 10 m alta; cryptae stomatophorae Typi II, parvae, simplices; epidermis supera folii stratiis 1 cellularum; limbus calycis cupuliformis lobis apiculatis; stamina monadelpha; ovarium 2-loculare ovuliis 16 axillaribus.

Glabrous tree 10 m high; young twigs rounded. Petioles 4–6 mm long; blades 6.5–11.9 cm long, 2.4–4.5 cm wide, elliptic to elliptic-ovate or seldom slightly obovate, abruptly acuminate at apex, acute to abruptly short-attenuate on the petiole at base; midrib grooved above, narrowly 2-winged below; lateral nerves obscurely visible to invisible above and below when dry. Midrib xylem tubular; stomatal crypts Type II or borderline I–II (see Morley, 1976); upper epidermis one cell thick, lacking mucilaginous walls; hypodermis none; foliar sclereids all terminal, variable in shape, mostly columnar with large branches at each end, sometimes slanting, sometimes with a horizontal central body at veinlet level bearing branches upward and downward. Peduncles terminal, axillary, and at the uppermost leafless nodes, 1 per side, of 1 internode 3–7 mm long, 1-flowered; bracts narrowly triangular, acute, entire, 1.2–1.5 mm long, deciduous at anthesis. True pedicels 8–11 mm long; flowers known only from buds, the buds yellow; flowers 4-merous; calyx including inferior ovary 4.5–5 mm long, obconic to slightly campanulate, 1.8–2.2 mm long, the surface flecked with scurfy patches at least when moist; calyx limb abruptly expanded and shallowly cup-shaped, 2.5 mm long, ca. 3.8 mm diam.; calyx lobes 0.7 mm long, 2.5 mm wide, broadly rounded-triangular and prominently apiculate. Immature petals ovate, acute, sessile, adherent to each other in bud, 8 mm long, ca. 3.5 mm wide. Stamens monadelphous, 4.2–4.5 mm long, 0.9–1.0 mm wide, adherent on the back to the petals in bud, this condition at anthesis unknown; filaments ca. 0.4 mm long; anthers 3.7–4.2 mm long; thecae 2.4–2.7 mm long; gland adaxial at the apex, shallowly concave, 0.7 mm long, 0.4–0.5 mm wide. Ovary 2-locular with axile placentation, each locule with ca. 8 ovules crowded at different levels on the placenta, the ovules 16 in all. Calyx prominent on the immature fruit; ripe fruit and seed unknown.

*Distribution.* Known only from the type locality near the southeast corner of the Laguna de Chiriquí on the north side of western Panama. "Terra firme, bosque alto, humedo sobre filos y pendientes."

The new species is the first member of *Votomita* known to occur in Central America. Its leaves are overall the simplest in the genus in their average size and shape, lack of hairs, undivided upper epidermis, strictly terminal foliar stone cells with only a moderate columnar tendency, and small simple stomatal crypts. The flowers, however, are of an intermediate level of reduction from the presumed ancestral type: in the nine species of *Votomita* there is a general trend from large-flowered plants with 4-locular ovaries and numerous ovules to small-flowered ones with 1 locule and 5–10 ovules. *Votomita cupuliformis* has a 2-locular ovary with 16 ovules; in this feature the plant is most similar to *V. roraimensis* of central Roraima, Bra-

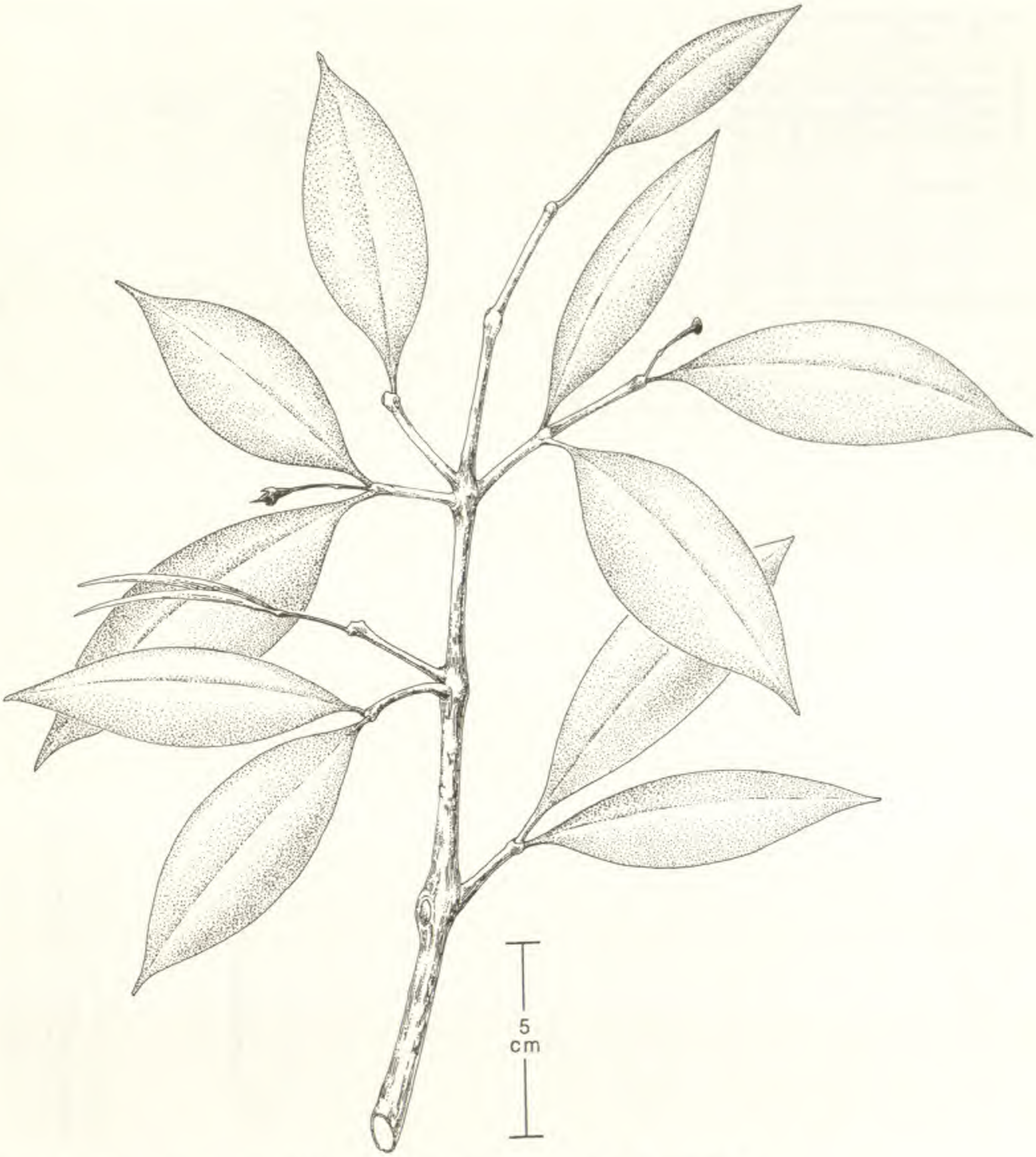


Figure 1. *Votomita cupuliformis* Morley & Almeda, habit drawing (by Ellen del Valle).

zil, which has 4 locules and 15–16 ovules. The new species is easily distinguished from *V. roraimensis*, however, by the former's longer petioles, simpler leaf anatomy, larger petals and stamens, and 2-locular ovary.

A key is provided to all nine species to illustrate how the three named since the latest monograph (*V. cupuliformis, V. pubescens, V. roraimensis*) compare to the six included in the monograph (Morley, 1976):

1a. Calyx including inferior ovary 7.5–10.5 mm long; ovules 20–48.
2a. Leaf blades pubescent beneath, 10.5–15.5 cm long . . . . . *V. pubescens* Morley
2b. Leaf blades (excluding the midrib) glabrous beneath, 7–12 cm long.
3a. Petioles 3–5 mm long, placentation axile . . . . . *V. plerocarpa* (Morley) Morley
3b. Petioles 7–12 mm long; placentation basal in each locule . . . . . *V. monadelpha* (Ducke) Morley
1b. Calyx including inferior ovary 2.2–5.6 mm long; ovules 5–16 and 36.
4a. Calyx including inferior ovary 5–5.6 mm long; stamens 5.4–6.1 mm long; ovules ca. 36, in 4 whorls . . . . . *V. orbinaxia* Morley

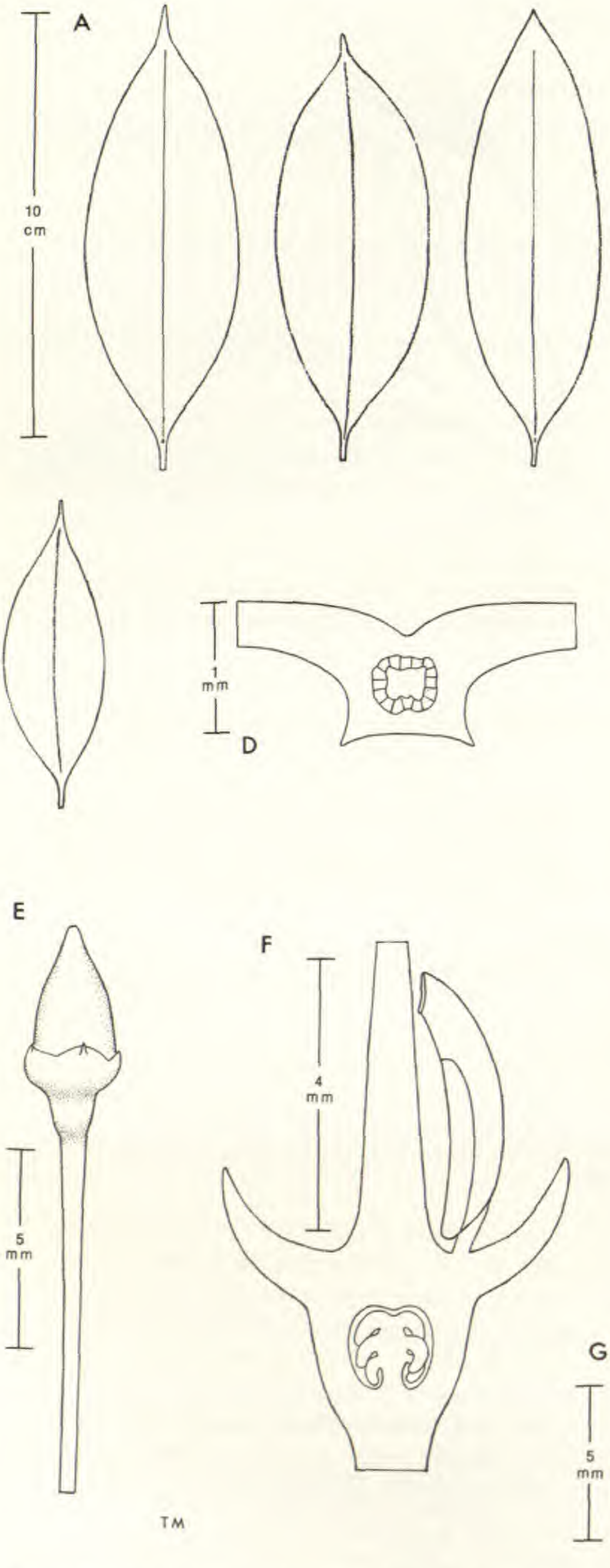


Figure 2. *Votomita cupuliformis.* —A. Leaf shapes (traced). B–I (camera lucida): —B. Cleared portion of leaf blade showing veins and terminal sclereids. —C. Cross section of leaf blade showing sclereids, stomatal crypts, and upper epidermis. —D. Cross section of leaf midrib. —E. Large flower bud. —F. Longisection of flower before anthesis. —G. Petal. —H. Anthers, face and side views. —I. Immature fruit. (All by TM.)

4b. Calyx 2.2–5 mm long; stamens 2.9–5.1 mm long; ovules 5–16.
5a. Calyx including inferior ovary 4.5–5 mm long; ovules 15–16.
6a. Petioles 1.5–2.5 mm long; petals ca. 4.7–5 mm long; anthers 2.6–2.8 mm long; thecae 1.2–1.3 mm long; ovary 4-locular . . . *V. roraimensis* Morley
6b. Petioles 4–6 mm long; petals ca. 8 mm long; anthers 3.7–4.2 mm long; thecae 2.4–2.7 mm long; ovary 2-locular . . . . . *V. cupuliformis* Morley & Almeda
5b. Calyx 2.2–4 mm long; ovules 5–10.
7a. Apex of blade abruptly acuminate; petioles 4–9 mm long; blades (7–) 9–12 cm long . . . *V. guianensis* Aublet
7b. Apex of blade rounded to acute and often mucronulate; petioles 1.5–4 mm long; blades 2.5–7.5 cm long.
8a. Blades 22–42 times as long as the petiole; pedicels 1–1.3 mm diam. 2 mm below the calyx teeth when dry . . . . . *V. orinocensis* Morley
8b. Blades 10–20 times as long as the petiole; pedicels 1.5–2.3 mm diam. 2 mm below the calyx teeth when dry . . . . . *V. monantha* (Urban) Morley

Literature Cited

Morley, T. 1976. Memecyleae (Melastomataceae). Fl. Neotrop. 15: 1–295.

# New Names in *Papaver* Section *Meconella* (Papaveraceae)

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ABSTRACT. Two combinations (*Papaver macounii* subsp. *discolor* and *P. radicatum* subsp. *kluanensis*) and a subspecies (*P. nudicaule* subsp. *americanum*) are published.

To complete a treatment of the scapose poppies (section *Meconella* of *Papaver*) for *Flora of North America*, it is necessary to publish one new combination and to validate one combination and a subspecies that have been previously proposed, but not in compliance with the *International Code of Botanical Nomenclature* (Greuter et al., 1994).

**Papaver macounii** subsp. **discolor** (Hultén) Rändel ex D. F. Murray, stat. nov. Basionym: *Papaver macounii* var. *discolor* Hultén in Hultén, Fl. Alaska Yukon 5: 803. 1945. TYPE: U.S.A. Alaska: Nome, *Anderson 3250* (holotype, S).

This combination was made by Rändel (1977: 425) without a full and direct reference to the basionym's author and place of valid publication as required by Article 32.2 (Greuter et al., 1994), which I have now supplied.

**Papaver nudicaule** subsp. **americanum** Rändel ex D. F. Murray, subsp. nov. TYPE: [Canada.] Klotassin area Yukon T[erritory], SW of Yukon River, between Selkirk and White River, Aug. 1916, *D. D. Cairnes 91890* (holotype, CAN).

Rändel (1977: 437) determined that the specimens from Alaska and Yukon represented a taxon distinct from the Asiatic material she had studied. She proposed *Papaver nudicaule* subsp. *americanum*, for which she supplied a diagnosis but failed to select a type as required by Article 37.1 (Greuter et al., 1994). As holotype I have chosen a specimen complete with leaves, flowers, and fruits, which Rändel had seen and annotated as subspecies *americanum*.

**Papaver radicatum** subsp. **kluanensis** (D. Löve) D. F. Murray, comb. et stat. nov. Basionym: *Papaver kluanensis* D. Löve in Löve & Freedman, Bot. Not. 109: 178–180. 1956. TYPE: [Canada]. Yukon [Territory]: N of Quill Creek camp, 20 mi. W of Burwash landing, alt. ca. 5000 ft., 19 June 1953, *Freedman s.n.* (holotype, MAN).

Doris Löve described *Papaver kluanensis* based on specimens from southwestern Yukon, which she later (1969) showed to be more widely distributed southward along the Rocky Mountains. Whereas she maintained this taxon as distinct from the Utah populations in this complex, I am, at least for the time being, including them within *P. radicatum* as subspecies *kluanensis*. Specimens of subspecies *kluanensis* from the type locality and elsewhere in the very northern part of its range are taller, with larger flowers and ellipsoid-subglobose capsules. Plants from the southernmost part of the range (Colorado, Utah, and New Mexico) are consistently shorter, with smaller flowers and oblong-obconic capsules. Taken alone, the Utah specimens are uniform and distinct; nevertheless, I agree with Rändel (1975) that the northern and southern populations are linked in Colorado and Wyoming by intermediate forms.

Welsh (1986) has applied the name *Papaver radicatum* var. *pygmaeum* (Rydberg) Welsh to the Utah specimens that I have determined as *P. radicatum* subsp. *kluanensis*. I view *P. pygmaeum* as morphologically distinct from the *P. radicatum* complex, being more closely related to the European *P. alpinum* group and different from the Utah plants in several respects. *Papaver pygmaeum* has leaves sparsely strigose to commonly glabrous, leaf lobes short and orbicular, and capsules with whitish (ivory) trichomes, whereas *P. radicatum* subsp. *kluanensis* has leaves coarsely strigose, lobes obovate, and capsules with light (straw colored) to dark brown trichomes.

*Papaver pygmaeum* is a diploid ($2n = 14$; Packer, 1968). Fabergé (1942, 1944) applied the name *P. pygmaeum* to a specimen from which he obtained a chromosome count of $n = 21$. The origin for this material was given by Fabergé as "Pike's Peak Utah." Clearly, this count was actually derived from a specimen of *P. radicatum* subsp. *kluanensis* from Pike's Peak, Colorado, sent to Fabergé by [W. P.] Cottam from his home base in Utah. *Papaver radicatum* subsp. *kluanensis* has a chromosome number of $2n = 42$ (Löve, 1969, based on Colorado material) or $2n = 56$ (fide Moss & Packer, 1983, based on material from Alberta).

*Acknowledgments.* My thanks to Robert Kiger and John McNeill for reviewing the manuscript and for suggesting improvements; and to the curators of CAN, MAN, NY, and S for loans or their many courtesies during visits to view types and other specimens.

Literature Cited

Fabergé, A. C. 1942. Genetics of the *Scapiflora* section of *Papaver* 1. The garden Iceland poppy. J. Genetics 44: 169–193.

———. 1944. Genetics of the *Scapiflora* section of *Papaver* 3. Interspecific hybrids and genetic homology. J. Genetics 46: 125–149.

Greuter, W., F. R. Barrie, H. M. Burdet, W. G. Chaloner, V. Demoulin, D. L. Hawksworth, P. M. Jørgensen, D. H. Nicolson, P. C. Silva, P. Trehane & J. McNeill, Editors. 1994. International Code of Botanical Nomenclature (The Tokyo Code), Adopted by the XVth International Botanical Congress, Yokohama, August–September, 1993. Regnum Veg. 131.

Löve, D. 1969. *Papaver* at high altitudes in the Rocky Mountains. Brittonia 21: 1–10.

Moss, E. H. & J. G. Packer. 1983. Flora of Alberta, ed. 2. Univ. Toronto Press, Toronto.

Packer, J. G. 1968. IOPB chromosome number reports XVII. Taxon 17: 285–288.

Rändel, U. 1975. Die Beziehungen von *Papaver pygmaeum* Rydb. aus den Rocky Mountains zum nordamerikanischen *P. kluanense* D. Löve sowie zu einigen nordost-asiatischen Vertretern der Sektion *Scapiflora* Reichenb. im Vergleich mit *P. alpinum* L. (Papaveraceae). Feddes Repert. 86(1–2): 19–37.

Rändel, U. 1977. Über Sippen des subarktisch-arktischen Nordamerikas, des Beringia-Gebietes und Nordost-Asiens der Sektion *Lasiotrachyphylla* Bernh. (Papaveraceae) und deren Beziehungen zueinander und zu Sippen anderer Arealteile der Sektion. Feddes Repert. 88(7–8): 421–450.

Welsh, S. L. 1986. New taxa and combinations in the Utah Flora. Great Basin Naturalist 46: 254–260.

# Validation of a New Species of *Diospyros* (Ebenaceae) from Yunnan, China

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ABSTRACT. *Diospyros xishuangbannaensis*, previously invalidly described, is validated.

*Diospyros xishuangbannaensis* was described in 1990 (Zhu & Wu, 1990), but two types, representing flowering and fruiting states, were designated, thus contravening Article 37 of the *International Code of Botanical Nomenclature* (Greuter et al., 1994) and making the name invalid. The species is herein validated by designating the fruiting material as the holotype.

**Diospyros xishuangbannaensis** C. Y. Wu & H. Chu, sp. nov. TYPE: China. Yunnan: Xishuangbanna, Mengla, Bubeng, 20 July 1988 (fr), *Chu Hua & Wang Hong 2451* (holotype, KUN).

Proxima *Diospyroti martabanicae* Clarke, sed ab ea flore masculo solitario, corolla breviore, staminibus 8, endospermio laevigato differt; a *D. pilosula* (A. de Candolle) Hiern foliis subtus persaepe dense pubescentibus, nervis lateralibus utrinsecus 10–15, tertiariis utrinque conspicuis, flore femineo 5-mero, flore masculo solitario, antheris attenuato-ovatis apice acutis differt.

Trees ca. 20 m tall; branchlets densely brown pubescent. Leaves oblong or oblong-lanceolate, 8–18 cm long, 3–4.5 cm wide, stiffly chartaceous to subcoriaceous, somewhat pubescent adaxially only on midvein when young, soon completely glabrous, abaxially with pubescence along midvein like that of young branchlets, base rounded or subcordate, apex acuminate; midvein sunken adaxially, elevated abaxially; lateral veins 10–15 on each side, flat adaxially, elevated abaxially, tertiary veins conspicuous on both surfaces; petiole 2–3 mm long, pubescent as in branchlets. Flowers solitary; staminate flowers 4-merous, on pubescent pedicels 8–10 mm long; calyx 6–7 mm long, divided nearly to base into linear-lanceolate lobes, appressed sericeous outside, glabrous inside; corolla salverform, sericeous outside as in calyx, glabrous inside, tube ca. 7 mm long, lobes ca. 9 mm long; stamens 8, unequal, glabrous; anthers attenuate-ovate, acute at apex; rudimentary ovary small villous; pistillate flowers 5-merous, on pubescent pedicels 10–16 mm long; calyx and corolla as in staminate flowers; ovary ovoid, pubescent, 4-loculed. Fruit globose, 2–2.5 cm diam., densely sericeous; fruiting pedicel 1–1.6 cm; fruiting calyx reflexed outward; seeds 4; endosperm smooth.

*Paratype.* CHINA. **Yunnan:** Xishuangbanna, Mengla, Manzhuan, 7 Mar. 1983, *Zhou Shochin & Wang Hong 2452* (KUN).

*Acknowledgments.* Michael G. Gilbert is thanked for pointing out the problem and Ihsan A. Al-Shehbaz for helping with the manuscript.

Literature Cited

Greuter, W., F. R. Barrie, H. M. Burdet, W. G. Chaloner, V. Demoulin, D. L. Hawksworth, P. M. Jørgensen, D. H. Nicolson, P. C. Silva, P. Trehane & J. McNeill, Editors. 1994. International Code of Botanical Nomenclature (The Tokyo Code), Adopted by the XVth International Botanical Congress, Yokohama, August–September, 1993. Regnum Veg. 131.

Zhu Hua & Wu Zhengyi. 1990. Contributions to the Flora of Xishuangbanna (1). Acta Bot. Yunnan. 12: 375–380.

# Lectotypification of *Kengyilia mutica* (Keng ex Keng & S. L. Chen) J. L. Yang, Yen & Baum (Poaceae), and Change of Circumscription

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ABSTRACT. A lectotype of *Kengyilia mutica* (Keng ex Keng & S. L. Chen) J. L. Yang, Yen & Baum is here designated based on an illustration of the holotype; the latter has been lost. A more complete description than the original, which was based on a single and incomplete specimen, is provided.

Professor Y. L. Keng identified a single specimen obtained from the Province of Qinghai, China, as *Roegneria mutica* Keng, nomen nudum. During 1944, Y. L. Keng collected grasses in Qinghai with his son, P. C. Keng. At that time Guide County was occupied by a military lord, Ma Bu-Fong and his herds of horses. Keng did not obtain permission to collect in this region. A friendly person who worked on the horse farm brought Keng a specimen. Keng examined the plant, decided that it differed from related species, and called it *Roegneria mutica* (P. C. Keng, pers. comm. 1992). He subsequently published *Roegneria mutica* Keng as a nomen nudum (Keng et al., 1957) and later provided a description (Keng et al., 1959), but in Chinese only, which resulted therefore in an illegitimate name. The Latin description was finally published in 1963 (Keng & Chen, 1963), giving it invalid status.

The single specimen on which this species was based may have been destroyed during the "Cultural Revolution" (Song Gui-Qing, pers. comm. 1992), or may not have been returned to the herbarium when it was lent for drawing the figure in Keng et al. (1959, and P. C. Keng, pers. comm.). This specimen is "No. 4, Military Horse Farm, Guide, Qinghai"—the precise locality is unknown; however, it was collected in an area near the two subsequent known locations (Fig. 1) and was conserved in the herbarium of Nanjing University (N). The only remains of the type collection are thus the illustration, figure 337 in Keng et al. (1959), because the protologue (Keng & Chen, 1963) referred to this figure. This interpretation is in accord with the definition of what constitutes type material in the *Code* (Greuter et al., 1994; Article 9.7 Footnotes). Thus, figure 337 in Keng et al. (1959) is here designated as the lectotype (Fig. 2).

**Kengyilia mutica** (Keng ex Keng & S. L. Chen) J. L. Yang, Yen & Baum, Hereditas 116: 27. 1992. Basionym: *Roegneria mutica* Keng ex Keng & S. L. Chen, Acta Nanjing Univ. 1: 87. 1963. TYPE: China. Qinghai Province: Guide County, Military horse farm, *4* ["No. 4, Military Horse Farm, Guide, Qinghai"] (holotype, N now lost). Lectotype, here designated: figure 337 in Keng et al. (1959).

*Roegneria mutica* Keng in Keng et al., Clav. Gen. & Sp. Gram. Sin. 75, 188. 1957. Nomen nudum. *Roegneria mutica* Keng in Keng et al., Fl. Illustr. Plant. Prim. Sin. Gram. 408, figure 337. 1959. Nomen inval., based only on Chinese description.

An expedition to Guide County, Qinghai Province, was conducted in 1993 in order to study the morphological variation at the type locality. There, we realized that what was described as an awnless species was in fact an unusual type and that most of the individuals of *Kengyilia mutica* have short lemma awns. Although we collected awnless specimens in 1986 on the Lajishan mountains, at 3200 m, we found in the 1993 collections only a few specimens with awnless florets intermixed with short-awned florets on the same spike. Most individuals of this species, based on study of extensive collections, are short-awned. Totally awnless plants have yet to be found. We provide here a revised description of *Kengyilia mutica* and a drawing (Fig. 3).

Perennial with fibrous roots. Culms 40–70 cm

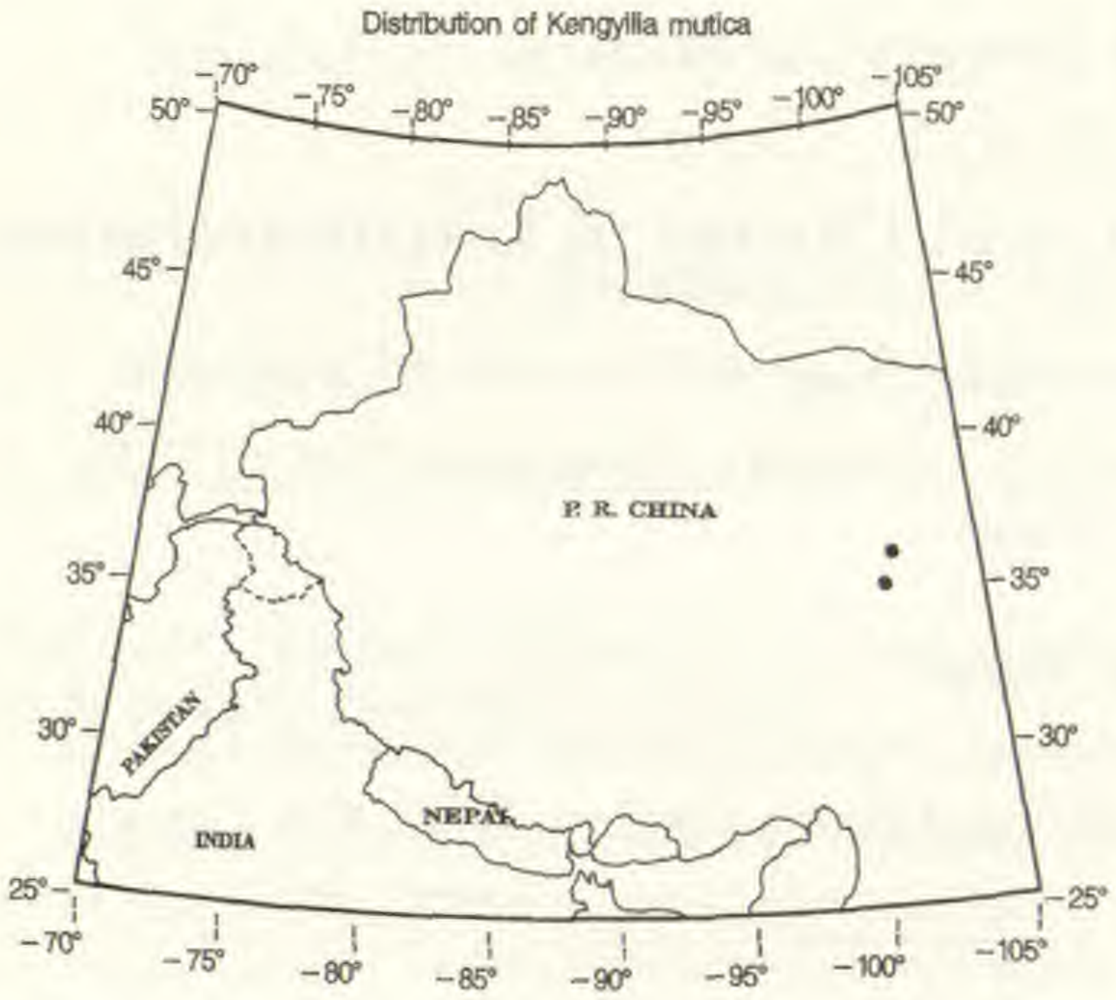


Figure 1. Distribution of *Kengyilia mutica* (Keng ex Keng & S. L. Chen) J. L. Yang, Yen & Baum.

tall, puberulent below the spikes; 3-noded, geniculate at the lowest node (Fig. 3A). Leaf sheath smooth, glabrous or puberulent; ligules scabrous, ca. 1 mm long; leaf blades flat or involute, glabrous or puberulent, 4–6 mm wide; tillers with narrow leaf blades, usually up to 19 cm long. Spikes erect or slightly curved, 5–9 cm long, 8 mm wide (Fig. 3A); rachis internodes puberulent, the upper ones 3–4 mm long, the lower ones 8–9 mm long. Spikelets yellow-green, 12 mm long, with 4–6 florets (Fig. 3I), the uppermost not well developed; rachilla internodes puberulent, ca. 1.5 mm long; glumes oblong ovate, 5–6 mm long, smoothly glabrous, acute, usually 3-nerved with the midnerve prominent (Fig. 3F, G); lemmas 5-nerved, densely hirsute (Fig. 3H), with rounded back, tips acute, mucronate (Fig. 3B) or ending in an awn 1.5–5 mm long (Fig. 3H); 1st lemma ca. 9.5 mm long; palea equal to or shorter than lemma, with an obtuse to slightly emarginate apex, ciliate toward tip on the two keels (Fig. 3C); anthers yellow or black, ca. 3 mm long. Caryopsis tip hirsute (Fig. 3E).

*Distribution in China.* Qinghai Province, Guide County (Fig. 1), endemic.

*Specimens examined.* All collected in 1993: CHINA. **Qinghai Province:** Guide County, Lajishan Mountain, alt. 3200 m, in Stipa steppe, *J. L. Yang & R. von Bothmer 860020, 860021, 930002, 930007* (all SAUTI, DAO).

圖337 無芒鵝观草

Figure 337 *Roegneria mutica* Keng sp. nov.
1. Adult plant; 2. Spikelet;
3. Florelet; 4. Dorsal view of palea;
5. Caryopsis; 6. Lodicules, anthers with filament ovary with stigmata.
(No. 4, Guide Military Ranch, Qinghai, Holotype)

Figure 2. Illustration of the lectotype of *Kengyilia mutica* (Keng ex Keng & S. L. Chen) J. L. Yang, Yen & Baum.

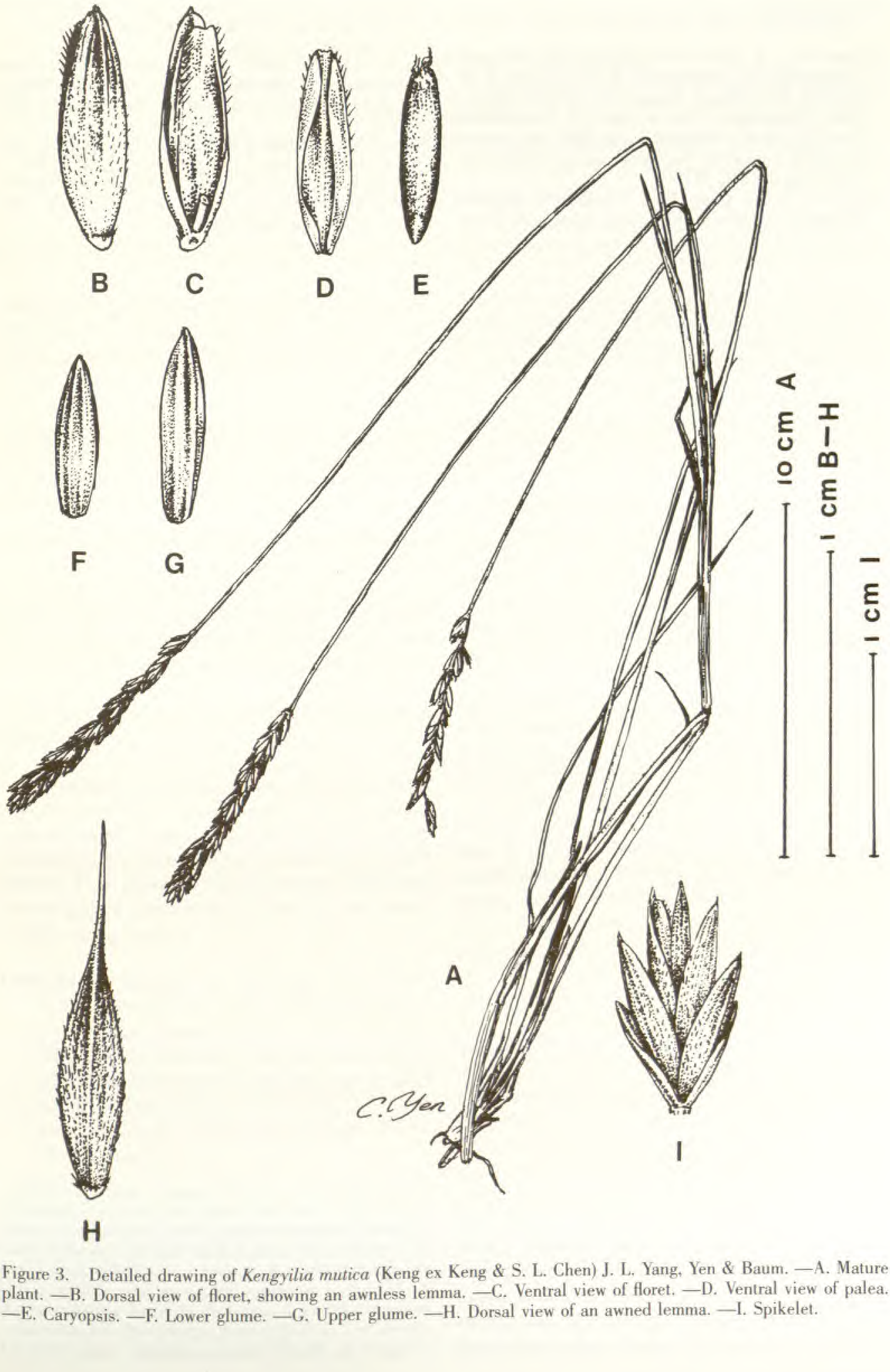


Figure 3. Detailed drawing of *Kengyilia mutica* (Keng ex Keng & S. L. Chen) J. L. Yang, Yen & Baum. —A. Mature plant. —B. Dorsal view of floret, showing an awnless lemma. —C. Ventral view of floret. —D. Ventral view of palea. —E. Caryopsis. —F. Lower glume. —G. Upper glume. —H. Dorsal view of an awned lemma. —I. Spikelet.

Literature Cited

Greuter, W., F. R. Barrie, H. M. Burdet, W. G. Chaloner, V. Demoulin, D. L. Hawksworth, P. M. Jørgensen, D. H. Nicolson, P. C. Silva, P. Trehane & J. McNeill, Editors. 1994. International Code of Botanical Nomenclature (The Tokyo Code), Adopted by the XVth International Botanical Congress, Yokohama, August–September, 1993. Regnum Veg. 131.

Keng, Y. L. & S. L. Chen. 1963. A revision of the genus *Roegneria* C. Koch of China. Acta Nanjing University (Biology) 1: 1–92. [In Chinese, with Latin descriptions of new species, and with an English summary.]

——— (editor), P. C. Keng, Y. C. Tang, B. Z. Gao, S. L. Chen & L. Liu. 1957. Claves Generum et Specierum Graminearum Primarum Sinicarum, Appendice Nomenclatione Systematica. Science Press, Beijing [in Chinese].

——— & S. L. Chen, J. R. Feng, Z. Y. Feng, B. Z. Gao, L. Z. Jia, X. Q. Jiang, P. C. Keng, L. Liu, W. Q. Shi, Y. C. Tang & S. Q. Zhong. 1959. Flora Illustrata Plantarum Primarum Sinicarum, Gramineae. 403, f. 337. Science Press, Beijing [in Chinese].

# *Dracontium croatii* (Araceae), a New Species from the Western Slopes of the Andes in Ecuador

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ABSTRACT. *Dracontium croatii* G. Zhu, a new species from the western slopes of the Andes in Ecuador, is described and illustrated. Morphologically, this species does not appear to be particularly close to any member of the genus and is readily distinguished by its showy greenish spathe, large and globose berries, rounded and strongly interrupted irregular warty seeds, and matte upper blade surface.

RESUMEN. *Dracontium croatii* G. Zhu, una especie nueva de las laderas occidentales de los Andes de Ecuador se describe e ilustra. Al parecer, la nueva especie no esta cercanamente relacionada con otros taxa en el género. Es fácilmente reconocible por la siguiente combinación de caracteres: la espata es vistosa y verdosa, la superficie adaxial de las hojas es opaca y las semillas y los frutos son redondeados.

*Dracontium* L. (Araceae), with 22 species and 2 varieties, is known exclusively from the New World tropics. One of the most poorly known genera of the Araceae, it is represented in Ecuador by at least 3 species, 1 of which is new to science. This new species was detected in the course of a taxonomic revision of the genus.

**Dracontium croatii** G. Zhu, sp. nov. TYPE: U.S.A. Missouri: St. Louis, cultivated plant in the Missouri Botanical Garden, *Zhu 1493* (holotype, MO); originally collected along unfinished road between Lita and San Lorenzo, 15.5 km W of Lita, 705 m, 0°55′N, 78°28′W, San Lorenzo Canton, Esmeraldas, Ecuador, *Croat 72368*. Figures 1, 2.

Herba terrestris, magna, tuberosa, unifoliata, usque plus quam 3 m alta; tuber hemisphaericum, usque 15 cm diam., 7 cm crassum, apice planum interdum tuberculis; folium bene ante vel post anthesin prodiens; petiolus 1.4–3 m longus, cylindricus, carnosus, atro aut purpureo-viridibus maculis, guttatus pallide viridis aut sordide albus; lamina tripartita usque 20 cm longis, 9 cm latis, apicibus acuminatis, interdum bifidis; pedunculus 1–1.7 m longus, 1.3–2 cm diam., cylindricus; spatha 23–50 cm longa, 8–20 cm lata, cucullata basi, obovata aspectu frontali, extus impolita, atroflava-viridis suffusa purpurea, intus velutina, flava-viridis apice et secus margines exteriores, cum nervis atropurpureis, viridi-alba basi usque 3 cm prope margines et usque 7 cm in medio; spadix 3–5 cm longus, 1.3 cm diam.; tepala 7–8, subcucullata apice; baccae globosae, usque 1–2 cm diam.; semina rubra, suffusa aurantiaca, plus minusve rotunda, usque 0.8–1 cm diam., 0.5 cm crassa.

Terrestrial herb, perennial, to more than 3 m tall. *Tuber* hemispherical, to 15 cm diam., 7 cm thick, 20–30 cm underneath the ground, flat at apex, with or without a few tubercles among numerous roots, underneath smooth, convex, without tubercles and roots. *Leaf* 1, arising from tuber 4–30 cm below the ground level; petiole 1.4–3 m long, 3.5–6 cm diam. at base, 1.5–2.5 cm diam. at apex, cylindric, fleshy, dark or purplish green, mottled pale green or dirty white forming a reptilian pattern, distal half smooth, proximal half with many protuberances; major divisions of blade 3, each to 1 m long, matte, sometimes fenestrate, upper surface green, lower surface slightly paler; ultimate segments to 20 cm long, 9 cm wide, oblanceolate, apex gradually acuminate or caudate, or bilobed, lobes gradually acuminate; smaller leaflets triangular, or ± oblanceolate, 3.5–15 cm long, 2.5–6 cm wide; midrib and major veins convex, sunken adaxially, round-raised abaxially, secondary veins impressed on upper surface and raised on lower surface; rachises pale green, smooth, faintly mottled as petiole, rachis (from petiole apex to the first major subdivision) of the middle division up to twice as long as that of lateral divisions. *Inflorescence* arising from apex of tuber before or after the leaf development; cataphylls to 20 cm long, unribbed, drying light brown toward base, darker brown toward apex; peduncle 1–1.7 m long, 1.3–2 cm diam. at mid point, cylindric, fleshy, dark blackish purple, sparsely and weakly streaked, violet or dark yellow-green, becoming somewhat more brownish with larger swatches of yellow-green above middle, these becoming obliquely arranged, larger and paler toward apex, beset with irregular protuberances through-

Figure 1. *Dracontium croatii* G. Zhu (*Croat 72368*). —A. Leaf. —B. Peduncle (left) and petiole (right).

out; spathe 23–50 cm long, 8–20 cm wide when open, conspicuously hooded, convolute at base, obovate in front face view, outside matte, green tinged purple, apex and the lower ⅓ of spathe densely purplish speckled, midrib broadly convex, pale yellowish green in lower half of spathe, purplish on upper half of spathe, with 11–12 dark purplish major veins on either side, these veins interconnected by oblique cross veins, inner surface velvety, tricolor: apex and along outer margins yellow-green, with dark purple veins, area 4–6 cm from the outer margins dark purple and becoming more velvety, area 3 cm high near the margins and 7 cm high medially from the base solid greenish white, the border between the white and purple portions abrupt but with smoothly feathered margin, apex probably rounded or weakly cuspidate (apparently somewhat damaged and split upon opening), outer margins thin and weakly curled back, moderately undulate toward base; spadix 3–5 cm long, 1.3 cm diam. excluding protruding styles, purplish, axis of spadix pinkish within, aerenchymatous. Flowers irregularly rounded, 2.5–3 mm diam.; tepals 7–8 per flower, 1.8–2.2 mm long, 1–1.5 mm wide, somewhat cucullate at apex, inner margin broadly rounded, purplish with paler, weakly raised projections, paler and somewhat scalloped along the edges; styles 1–1.2 mm long, 0.8–1 mm diam., spindle-shaped, purplish, covered with weakly raised projections as tepals; stigmas somewhat cushion-shaped, 2- or rarely 3-lobed, 0.4 mm high, 0.8 mm diam., covered with brushlike translucent bristles, becoming purplish after anthesis; stamens not emerging above tepals; filaments ca. 1.5 mm long; anthers brownish, clearly visible between tepals and style prior to anthesis. Berries globose, 1–2 cm diam., olive-green with purplish spots, becoming deep red; seeds 2 per berry, red tinged orange, with thick, strongly interrupted, irregular warts, round, 0.8–1 cm diam., 0.5 cm thick.

*Dracontium croatii* is apparently restricted to the western slopes of the Ecuadorian Andes between 450 and 1330 m. In addition to the type locality, collections have also been made from Carchí Province. The species may also be expected in Los Rios Province in Ecuador, as well as adjacent areas of Colombia.

Morphologically, *Dracontium croatii* does not appear to be particularly close to any member of the genus. It is readily distinguished by its showy spathe with a unique coloration: outer surface greenish with raised, dark purple veins, inner surface velvety, dark purple with 4–6 cm wide, yellow-green outer margins and a solid greenish white area 3–7 cm high at the base. The globose berries of the species, at 1–2 cm diam., are the largest in *Dracontium*. Other species, such as *D. spruceanum*, may also have globose berries, but they never exceed 1 cm diam. Seeds of *D. croatii* are definitely the largest known in the genus; the distinctive seed morphology is illustrated on one of the cover pages of *Aroideana* (Madison, 1980). *Dracontium croatii* is also often marked by a matte upper blade surface, which is glossy or semiglossy in other species.

Inflorescences of *Dracontium croatii* have been collected in November, fruits in July. Under cultivation, *D. croatii* flowers in September and from November to January. It produces inflorescences before or immediately after new leaf development.

Figure 2. *Dracontium croatii* G. Zhu. —A. Infructescence (*Croat 72368*). —B, C. Inflorescence (*Zhu 1493*, type). —D. Inflorescences opened to show the spadix and the creamy-white area at the base of the inner spathe surface (*Zhu 1493*, type).

*Dracontium croatii* is named in honor of Thomas B. Croat, from whose collection of living Araceae in the Missouri Botanical Garden I recognized this new species and prepared the holotype. Two other live collections are known: one from the Marie Selby Botanical Gardens (75-491), the other from the Missouri Botanical Garden (received from the Selby Gardens, 78-2173); both were collected by Calaway Dodson in Pichincha Province, Ecuador, in 1975 and 1978. Other plants of this species have been distributed by the Selby Gardens to various other places under the name *D. ornatum*. One of these plants is cultivated by Dewey Fisk in Florida.

*Paratypes.* ECUADOR. **Carchí:** Forestry Reserve, vicinity of encampment in Awá Ethnic, 0°58′N, 78°16′W, 1330 m, *Hoover 3279* (QCA); trail from San Marcos to Tobar Donoso, 660 m, 1°07′N, 78°20′W, *Barfod 41597* (AAU, MO, QCA). **Esmeraldas:** along unfinished road between Lita and San Lorenzo, 15.5 km W of Lita, 705 m, 0°55′N, 78°28′W, *Croat 72368* (MO). **Pichincha:** bridge over Río Chiguilpe near junction with Río Baba, 7 km from junction of entrance road at 7 km from Santo Domingo on highway to Quevedo, 450 m, *Dodson 5951* (SEL); La Centinela, at crest of Montañas de Ila on road 12 km from Patricia Pilar to 24 de Mayo, 600 m, *Dodson 7288* (MO, SEL), *Dodson & Fallen 7762* (MO, QCNE, SEL); La Centinela, 0.2 km past Escuela Mixta La Centinela, along trail to left of road, exactly 13 km E from main Santo Domingo–Quevedo Highway in Patricia Pilar, 1000 m, 0°32′S, 79°11′W, *Croat 73040* (MO). **Cultivated plants:** Marie Selby Botanical Gardens (75-461, vouchered by *Dodson 5951*), *Christenson 1576* (SEL), *Croat 71798* (MO), *Madison 4140* (SEL); Marie Selby Botanical Gardens (78-2173, vouchered by *Dodson 7288*), *Christenson 1154* (SEL), *Plowman 10926* (F); Missouri Botanical Garden (vouchered by *Croat 72368*), *Zhu 1518* (MO); Missouri Botanical Garden (received from the Marie Selby Botanical Gardens, 78-2173, vouchered by *Dodson 7288*), *Zhu 1453* (MO).

*Acknowledgments.* This paper is part of my doctoral dissertation to be submitted to the University of Missouri-St. Louis Department of Biology. I thank my major advisor, Thomas B. Croat, for discussions and critical suggestions on this subject. I also thank Mike Grayum, Sue Thompson, Germán Carnevali, Eleanor Sauer, P. Mick Richardson, David Boufford, Bruce Bartholomew, Petra Maleseviich, Donna Atwood, Kathy Upton, and Hong Song for comments on the manuscript and other assistance. I extend my appreciation to Dewey Fisk, Julius Boos, and curators of the Marie Selby Botanical Gardens and Herbarium for providing specimens and photos. The research was conducted at the Missouri Botanical Garden and was partially supported by NSF doctoral dissertation research grant DEB-9310171 to T. B. Croat and G. Zhu, and by a grant from the Andrew W. Mellon Foundation to G. Zhu.

Literature Cited

Madison, M. 1980. Cover photo. Aroideana 3(1): 1–2.

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# A New *Blakea* (Melastomataceae: Blakeeae) from Tapantí National Park, Costa Rica

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ABSTRACT. *Blakea tapantiana*, a new Costa Rican endemic, is described, illustrated, and compared with *B. grandiflora*, an allopatric Costa Rican endemic that occurs at higher elevations and flowers sporadically throughout the year. The new species is distinguished by its short-pedicellate flowers, caudate-acuminate outer floral bracts, white petals, and unappendaged anther thecae.

*Blakea*, a neotropical genus with over 100 described species, continues to yield new Mesoamerican taxa of local distribution (Umaña & Almeda, 1991). Unlike many species of *Blakea*, which tend to flower sporadically throughout the year, the species proposed here appears to flower for a short period during the rainy season followed by a rather lengthy period of fruit maturation. This probably accounts, in part, for the paucity of flowering and mature fruiting specimens in herbaria and emphasizes the need for repeated visits to mid-elevation montane forests in Costa Rica and elsewhere in tropical America.

**Blakea tapantiana** Umaña & Almeda, sp. nov. TYPE: Costa Rica. Cartago: Parque Nacional Tapantí, Sendero Oropéndola, 9°48′18″N, 83°57′12″W, 1200 m, 3 Sep. 1992 (fl), *Umaña et al. 497* (holotype, CR; isotypes, CAS, COL, F, K, MEXU, MO, US, USJ, WIS). Figure 1.

*Frutex epiphyticus vel terrestris. Ramuli primum subquadrangulati demum teretes sicut foliorum subtus venae primariae et secundariae pedicelli bracteaeque primum densiuscule furfuracei, demum glabrescentes. Lamina elliptica vel oblongo-elliptica, apice caudato-acuminato. Flores 6-meri in quoque nodo superiore 1–3, pedicellis 0.6–1 cm longis; bracteae exteriores ca. 3–6 mm coalitae apice hebeti-acuminato. Antherae 4.5–5 × 1–1.5 mm inter se non cohaerentes; connectivum dorsaliter paulo elevatum ecalcaratum.*

Terrestrial or epiphytic shrubs 2–6 m tall. Upper branchlets rounded-quadrate to somewhat sulcate, becoming rounded and glabrous with age. Vegetative buds, young branchlets, young petioles, primary and secondary abaxial leaf veins, and immature inner and outer floral bracts densely to moderately covered with dendritic and scurfy hairs. Mature leaves of a pair equal to somewhat unequal in size, essentially glabrous adaxially or sparingly beset with a mixture of paleaceous, dendritic, and/or conic hairs along the elevated veins; petioles 1.5–3.5 cm long; blades coriaceous, 8.3–17 cm long and 4.1–7.6 cm wide, elliptic to oblong-elliptic, rarely elliptic-obovate, apex acuminate to caudate-acuminate, base acute varying to obtuse, margin denticulate to subentire, 5-nerved or 5-plinerved with the innermost pair of primary veins diverging from the median vein 3–6 mm above the blade base, the striolate transverse secondary veins spaced 1.5–3 mm apart at the widest

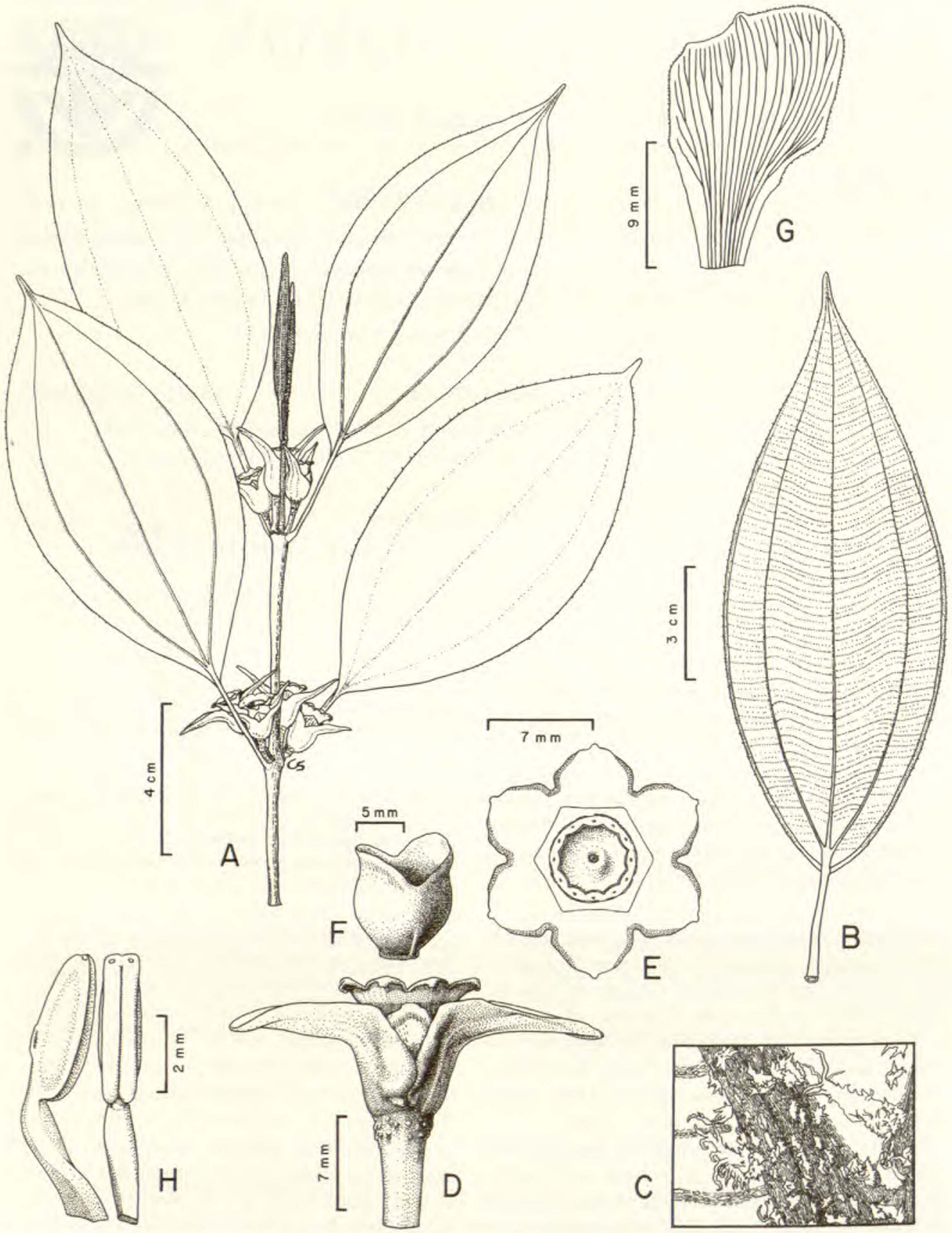


Figure 1. *Blakea tapantiana* Umaña & Almeda. —A. Habit. —B. Representative leaf (abaxial surface). —C. Enlargement of a primary leaf vein (abaxial surface). —D. Immature fruit enveloped by outer and inner floral bracts. —E. Young fruit (top view) showing ovary summit, torus, and calyx lobes. —F. Fused inner floral bracts. —G. Petal. —H. Stamens, lateral view (left) and ventral view (right). (A–C from *Almeda et al. 6860*; D–H from *Umaña et al. 497*.)

portion of the blade. Flowers erect, 1–3 in each leaf axil of uppermost branches; pedicels 0.6–1 cm long, thick but somewhat compressed and 2-edged, glabrous and lenticellate. Floral bracts sessile, entire; outer bracts 1.8–2.5 × 0.8–1.1 cm, fused basally for 3–6 mm, ovate, apex acuminate to caudate-acuminate, margin entire, 3-veined with only the median vein usually prominulous, glabrous throughout; inner bracts 1–1.2 cm long, connate basally for nearly half their length to form a 2-lobed cuplike collar that envelops the hypanthium but is somewhat concealed by the outer bracts, the free portions of the inner bracts rounded-triangular and glabrous, 0.4–0.7 × 0.7–0.8 cm. Hypanthium (in young fruit) campanulate, 0.8–1 cm long to the torus and 0.6–0.8 cm diam., glabrous. Calyx tube 2.5–3 mm long; calyx lobes 4.5–6 mm long and 5–6 mm wide basally, rounded-triangular, margin ± entire and conspicuously callose-thickened, glabrous on both surfaces. Petals 6, glabrous, 17–21 × 7–10 mm, white, narrowly obovate, apically rounded (sometimes obliquely so) and often abruptly and bluntly acute, essentially entire and ciliolate. Stamens 12, isomorphic; filaments 5–7 mm long, complanate, glabrous and declined to one side of the flower opposing the style; anthers 4.5–5 mm long, 1–1.5 mm wide, yellow, oblong, laterally compressed with two well-separated pores at the truncate apex; connective slightly dilated dorso-basally ca. 0.5 mm above the filament insertion into a low blunt thickening. Ovary wholly inferior, 6-celled, glabrous at the slightly elevated bluntly conic apex but lacking a collar. Style somewhat declinate, glabrous, 10–11 mm long; the expanded stigma subtruncate to narrowly conic. Mature berry and seeds not seen.

*Distribution.* This little-collected cloud forest species is known only from Cartago Province, Costa Rica, in a region extending from the recently designated (1993) Tapantí National Park (formerly Refugio Nacional de Vida Silvestre) to Valle Escondido on the Atlantic slope of the Cordillera de Talamanca at 1150–1450 m.

*Blakea tapantiana* is notable for its caudate-acuminate leaf apices, short-pedicellate flowers, acuminate to caudate-acuminate outer floral bracts, white petals, and unappendaged anther thecae.

Among the few white-flowered Costa Rican species of *Blakea* that exhibit both an epiphytic and free-living shrubby habit, *B. tapantiana* is likely to be confused only with *B. grandiflora* Hemsley. The latter species is also endemic to Costa Rica, but it is most commonly encountered in the wet wooded slopes and valleys of the Cordillera Central and Cordillera Tilarán.

Many of the diagnostic features that can be used to separate *Blakea tapantiana* from *B. grandiflora* are quantitative. The leaf blades of *B. grandiflora* are consistently larger (13–25.5 × 7.7–14.7 cm), as are the pedicels (2.5–4.5 cm), outer floral bracts (1.3–2 cm wide), and fully expanded petals (25–35 × 25–32 cm). In *B. grandiflora* the outer floral bracts are fused basally for 8–15 mm, but they are fused for only 3–6 mm in *B. tapantiana.* Flower color also appears to provide a diagnostic field character for distinguishing the two species. The apex of floral buds in *B. tapantiana* is pale pink, but the petals are completely white when fully expanded. In *B. grandiflora,* however, the buds are deep pink, and the expanded petals are flushed pink apically on one or both surfaces.

Other more subtle but consistent differences can be used to distinguish these two species. In overall aspect the vegetative and floral organs of *Blakea grandiflora* are coarser and thicker, but these are difficult to quantify. The anthers of *B. grandiflora* have a distinctive blunt appendage borne dorsally on the connective about 1 mm above the base of the thecae. The anther connective in *B. tapantiana* is merely thickened and not elaborated into a knobby appendage. *Blakea grandiflora,* like *B. tapantiana,* has a sparse to dense indument on uppermost branchlets, vegetative and young floral buds, and petioles that consists of coarse dendritic hairs that vary toward or are intermixed with paleaceous hairs that have somewhat lacerate margins. In *B. tapantiana* the dendritic hairs are not as coarse or as well developed and vary toward a furfuraceous indument on abaxial leaf surfaces.

Taken together these consistent differences, coupled with the elevational and geographical separation between *B. tapantiana* and *B. grandiflora,* provide a compelling rationale for recognizing two species. This taxonomic interpretation is consistent with a pattern of sharply discontinuous quantitative differences seen in other species pairs such as *B. austin-smithii* Standley and *B. chlorantha* Almeda and in *B. calycosa* Gleason and *B. tuberculata* Donnell Smith.

*Paratypes.* COSTA RICA. **Cartago:** Refugio Nacional de Fauna Silvestre Tapantí, Sendero de la Oropéndola bordering Río Macho, 22 Mar. 1986 (fr), *Almeda et al. 5699* (CAS, CR, MO, NY); Refugio Nacional de Vida Silvestre, Sendero de la Oropéndola about 1.2–2.7 km from the reserve entrance, 1 Mar. 1991 (fr), *Almeda et al. 6860* (CAS, CR, F, US); Refugio Nacional de Vida Silvestre, Sendero de la Oropéndola, 13 Feb. 1992 (fr), *Almeda et al. 6971* (CAS, CR, MO, US); bank of Río Grande de Orosí, 4 km S of Tapantí, 15 Sep. 1967 (fl), *Lent 1280* (F); Valle Es-

condido, 15 Apr. 1966 (fr), *Schnell 689* (F); Parque Nacional Tapantí, Sendero Oropéndola, 9°48′18″N, 83°57′12″W, 1200 m, 20 Aug. 1992 (fl), *Umaña et al. 496* (CR), 29 Sep. 1992 (fl), *Umaña et al. 498a* (CR), 24 Sep. 1993 (fl), *Umaña et al. 498b* (CR).

*Acknowledgments.* We thank Colleen Sudekum for preparing the line drawings, Barrett Anderson, Bruce Bartholomew, Thomas F. Daniel, Leticia Pacheco, and Nelson Zamora for assistance in the field, the staff of the Herbario Nacional de Costa Rica for logistical support, and the Servicios de Parques Nacionales de Costa Rica for permission to collect in protected areas of Costa Rica.

Literature Cited

Umaña D., G. & F. Almeda. 1991. *Blakea costaricensis* (Melastomataceae): A remarkable new epiphyte from southeastern Costa Rica. Selbyana 12: 1–4.

# Placement of *Arabidopsis parvula* in *Thellungiella* (Brassicaceae)

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ABSTRACT. The genus *Thellungiella* is recognized, and the characters separating its two species from *Arabidopsis* are given. *Arabidopsis parvula* (Schrenk) O. E. Schulz is recognized in *Thellungiella.*

The limits of *Arabidopsis* have been the subject of considerable controversy, and as many as 50 species were previously placed in the genus (Al-Shehbaz, 1988; Price et al., 1994). Detailed morphological and molecular studies by the authors reveal that *Arabidopsis* includes less than ten species, most of which were previously assigned to other genera, and that the remaining species are more appropriately placed in five or six genera. The results of these on-going studies will be published elsewhere.

The present paper deals with two species here recognized as members of *Thellungiella* O. E. Schulz. *Thellungiella parvula* has generally been accepted in *Arabidopsis* in all recent floras (e.g., Ball, 1964; Busch, 1939; Hedge, 1965, 1968; Pavlov, 1961) that cover the areas of its range. The generic placement of *T. salsuginea* (Pallas) O. E. Schulz has been more controversial; although several authors followed Schulz (1924) in treating it in *Thellungiella,* Al-Shehbaz (1988) and Rollins (1993) retained the species in *Arabidopsis.* Schulz (1924, 1936) placed *Arabidopsis* and *Thellungiella* in different subtribes separated solely on the basis of presence versus absence of seed-coat mucilage. As shown by Vaughan and Whitehouse (1971), the presence or absence of mucilage in wetted seeds can be observed in various species of the same genus and, therefore, is not a reliable taxonomic character. Although the seeds of *T. parvula* produce mucilage upon wetting and those of *T. salsuginea* do not, it is abundantly clear that this and other differences given in the key below do not justify the placement of the two species in different genera.

In addition to *Thellungiella salsuginea,* Schulz (1924), Busch (1939), and Pavlov (1961) recognized another species, *T. halophila* (C. A. Meyer) O. E. Schulz, which they separated from *T. salsuginea* primarily by having coarsely dentate to divided instead of entire to repand basal leaves. It is highly unlikely that these differences alone justify the recognition of *T. halophila* as distinct from *T. salsuginea.* Because the types of these two species were not available for this study, we refrain from formally reducing *T. halophila* to the synonymy of *T. salsuginea.*

As here delimited, *Thellungiella* consists of two (or perhaps three) species that are centered primarily in Kazakhstan and neighboring Russia. *Thellungiella parvula* is distributed in Kazakhstan, southern Russia, Turkmenistan, and Turkey, whereas *T. salsuginea* is widespread in Kazakhstan, southern Russia, Mongolia, northern China, Canada, and the United States. Both species are restricted to strongly saline soils, and such edaphic adaptation to salinity, which is rare elsewhere in the Brassicaceae, is not exhibited by any species of *Arabidopsis.* In addition, both species are glabrous throughout, are glaucous on stems and leaves, and do not produce well-defined basal rosettes. All species of *Arabidopsis* produce basal rosettes that often persist well after fruit maturity, and none has glaucous stems and leaves. The characteristic indumentum of mixed simple and stalked furcate trichomes should readily distinguish species of *Arabidopsis* from members of *Thellungiella.* The two species of *Thellungiella* are easily separated as follows:

1a. Cauline leaves oblong to ovate or cordate, not fleshy, auriculate to rarely amplexicaul at base; infructescence axis straight; petals much longer than sepals; seeds not mucilaginous when wetted . . . . . *T. salsuginea*

1b. Cauline leaves linear to linear-oblong, fleshy, not auriculate at base; infructescence axis flexuous; petals subequaling sepals or absent; seeds mucilaginous when wetted . . . . . *T. parvula*

**Thellungiella parvula** (Schrenk) Al-Shehbaz & O'Kane, comb. nov. Basionym: *Diplotaxis? parvula* Schrenk in Fischer & C. A. Meyer, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint Pétersbourg ser. 2, 2: 199. 1844. TYPE: [Kazakhstan]. "In desertis salsuginosus ad Tersakkan," *A. Schrenk s.n.* (holotype, LE; isotype?, G).

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Literature Cited

Al-Shehbaz, I. A. 1988. The genera of Sisymbrieae (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arbor. 69: 213–237.

Ball, P. W. 1964. *Arabidopsis*. *In*: T. G. Tutin et al. (editors), Fl. Europaea 1: 267–268.

Busch, N. A. 1939. *Arabidopsis*. *In*: V. L. Komarov (editor), Fl. URSS 8: 76–80.

Hedge, I. C. 1965. *Arabidopsis*. *In*: P. H. Davis (editor), Fl. Turkey 1: 489–490.

———. 1968. Sisymbrieae. *In*: K. H. Rechinger (editor), Fl. Iranica 57: 309–342.

Pavlov, N. V. 1961. Flora Kazakhstana 4: 1–545.

Price, R. A., J. D. Palmer & I. A. Al-Shehbaz. 1994. Systematic relationships of *Arabidopsis*: A molecular and morphological perspective. *In*: E. M. Meyerowitz & C. R. Sommerville (editors), *Arabidopsis*. Cold Springs Harbor Laboratory Press, New York.

Rollins, R. C. 1993. The Cruciferae of Continental North America. Stanford Univ. Press, California.

Schulz, O. E. 1924. Cruciferae–Sisymbrieae. *In*: A. Engler (editor), Pflanzenreich IV. 105(Heft 86): 1–388.

———. 1936. Cruciferae. *In*: A. Engler & K. Prantl (editors), Natürlichen Pflanzenfamilien ed. 2. 17B: 227–658.

Vaughan, J. G. & J. M. Whitehouse. 1971. Seed structure and the taxonomy of the Cruciferae. Bot. J. Linn. Soc. 64: 383–409.

# New Species of *Cestrum* (Solanaceae) and Synonymy under Two Widespread Species

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ABSTRACT. Three new species of *Cestrum, C. tillettii, C. jaramillanum,* and *C. ruizteranianum,* are newly described from Venezuela. *Cestrum tomentosum* L. f. and *C. strigilatum* Ruiz & Pavón have been identified as the correct names for two species for which many names have been proposed, and synonymies for these two species are presented.

Three new species are described from different parts of Venezuela: Sierra de Perijá in northeastern Zulia State, the western, Andean region of Mérida State, and the more or less central part of the coastal range in the Federal District. The last species is also found in Ecuador.

Two other widespread species have been known under many different names, and because concepts of their ranges have been fragmented with so many names in use, we present the synonymy here, rather than waiting until a revision of the genus can be published for some major region. One of these, *C. tomentosum* L. f., ranges from Mexico to Peru and Venezuela; the other, *C. strigilatum* Ruiz & Pavón, ranges from Costa Rica to Venezuela, Peru, Brazil, and Argentina. *Cestrum* embraces many species with local or regional distributions, but these two add to the short list of species that are widespread in both Central and South America: *C. alternifolium* (Jacquin) O. E. Schulz, *C. latifolium* Lamarck, *C. megalophyllum* Dunal, *C. microcalyx* Francey, *C. reflexum* Sendtner, *C. racemosum* Ruiz & Pavón, and *C. scandens* Vahl.

**Cestrum jaramillanum** Benítez & D'Arcy, sp. nov. TYPE: Ecuador. Pichincha: Centenela, Montañas de Ila, 12 km E of Patricia Pilar, virgin rain forest, 550–650 m, 79°19′W, 0°34′S, 10 July 1979 (fl), *Løjtnant & Molau 15835* (holotype, AAU; isotype, GB). Figure 1.

Arbor frutexve 2–3 m, foliis ovatis, basi rotundatis, truncatis, subcordatisve, membranaceis, glabrescentis, foliis minoris ovatis. Inflorescentia axillaria, subumbellata, axibus 6–7 mm longis, tomentulosis glabratisve. Bracteae sessiles foliaceae, lanceolatae, ad maturitatam fructus persistens, lateraliter calycem involvens.

Shrub or small tree 2–3 m, branched, the branches slender, at first compressed, sometimes drying grooved, later terete, tomentulose with mostly reduced, crinkled ascending hairs, the internodes 3–4.5 cm long. Leaves ovate, 10–14 × 4–7.5 cm, basally rounded, truncate, or subcordate, apically short-acuminate, membranous or chartaceous, glabrous above on emerging, the basal half beneath tomentulose on emerging, glabrescent, the veins inconspicuous above, the costa and major veins slightly reddish, somewhat elevated and finely puberulent beneath, the lateral veins 7–8 on each side, ascending, distally arcuate or looping and forming a submarginal vein 0.5–1 cm from the margin, the margin plane; petiole 5–10 mm long, finely pubescent; minor leaves ovate, 7 × 1.5 mm, sessile, glabrate. Inflorescences axillary, the peduncle ca. 1 mm long, longer in fruit, subumbellate with 3 axes 6–7 mm long, tomentulose to glabrate, in fruit 15 mm long. Flowers sessile; bracts foliaceous, narrowly lanceolate, 10 × 3.5 mm, persistent in fruit and partially enveloping the calyx laterally, sessile, acuminate, glabrate or pubescent on both sides; calyx tubular, 4 × 2.5 mm, drying stramineous, basally rugulose, glabrate, 5-lobed, the lobes deltoid to broadly acuminate, faintly 5-costate; corolla pale green, 29–30 mm, the tube 26 mm long, gradually expanded upward, the mouth not contracted, 2.5–3 mm wide, 5-lobed, the lobes 6–6.5 × 1 mm, oblong, the apex acute, the pleated margin short-pilose; stamens 22–23 mm long, the filaments straight, smooth, glabrous, basally adnate for 21 mm, free 1 mm; anthers orbicular, 1 mm across; ovary 0.7 mm diam., slightly rugose, glabrous; ovules 5–6;

Figure 1. *Cestrum jaramillanum* Benítez & D'Arcy. —A. Flowering branch. —B. Flowers. —C. Flower opened longitudinally showing corolla, anthers, and pistil. —D. Fruit. (A, B, C after *Løjtnant & Molau 15835*; D after *Steyermark 92147*.)

style 23 mm long; stigma slightly bilobed, included. Fruit ovoid, 8–10 × 6–7 mm, the pericarp thin, about equaling and loosely enclosed in the bract; seeds 3–4, dark brown, 5–6.5 mm long.

*Cestrum jaramillanum* is found in moist forests on the western slopes of the Ecuadorean Andes and on slopes of the Venezuelan coastal cordillera at 550–1300 m elevation.

This species is named in honor of Jaime Lucio Jaramillo Asanza, professor and active plant collector at the Pontificia Universidad Católica del Ecuador in Quito, who has greatly assisted many botanists visiting his country.

This new species is suggestive of *Cestrum reflexum* Sendtner and *C. amictum* Schlechtendal, both described from Brazil and having conspicuous bracts, but in *C. reflexum* the corolla tube is abruptly expanded at the throat, and the plant is scandent; in *C. amictum* the leaves are basally acute or acuminate and decurrent on the petiole, and the minor leaves are reniform. This new species is apparently a plant of lower or middle elevations, the two collections being made at 550–1300 m.

*Paratype.* VENEZUELA. **Distrito Federal:** Cerro Naiguatá, laderas pendientes del Norte, arriba del pueblo de Naiguatá, bosque humedo denso, Lomas de Las Delicias entre Quebrada de Basenilla y Quebrada Guayoyo, 9–12 km suroeste de Hacienda Cocuizal, 1000–1300 m, 15–19 Nov. (fl, fr), *Steyermark 92147* (NY, US, VEN).

**Cestrum ruizteranianum** Benítez & D'Arcy, sp. nov. TYPE: Venezuela. Mérida: Distrito Rangel, trail from La Negrita downstream towards Puente de La Escalera, montane cloud forest, 2550–2950 m, 1–2 Nov. 1978 (fl), *Luteyn et al. 6171* (holotype, NY). Figure 2.

Flores copiosi, calyce atrobrunneo, extus glanduloso, pilos sparsos ferens, corolla 20–26 mm longa, dilute viridi ex purpurea. Filamenta 7–9 mm ad corollam coalita, ad basim parte adnata pubescenti, in loco conjunctionis tumidis, geniculatis, parte libera 7.5–9.5 mm. Fructus haud suppetunt.

Shrub 1–4 m tall, erect, branched, young stems angular, terete when mature, scurfy pubescent with dark, crinkled, perhaps branched hairs. Leaves narrowly elliptical to elliptical, 4–6 × 1.5–3 cm, basally obtuse, apically acute or obtuse, firmly membranous, glabrous on both sides except for some scurfy hairs on minor veins, the major veins impressed above, elevated beneath, 8–10 on each side, ascending, looping and uniting near the margins, the margins slightly revolute; petioles 6–8 mm long, slender, inrolled, tomentulose above; minor leaves sometimes present, ovate, 10–13 × 5–7 mm, with petioles 0.5–1 mm long. Inflorescences axillary racemes, sometimes appearing as terminal panicles, 2.5–10 cm long; peduncles 0.7–5 cm long; bracts 1.5–2.5 mm, linear. Flowers with pedicels obsolete; calyx drying dark brown, tubular, 6–8 × 3–3.5 mm, faintly striate, thick, glandular and with sparse hairs outside, pubescent within and with glandular hairs halfway down, 5-lobed, the lobes 2 × 2 mm; corolla pale green, purplish outside, pale yellowish green inside, 20–26 mm long, exserted ca. 19 mm from the calyx, the tube 17–20 mm long, 3–3.5 mm at its widest, contracted around the ovary and then gradually expanded upward, the throat not constricted, 5 mm wide at the mouth, 5-lobed, the lobes 3–5 × 1.5–2 mm, narrowly triangular-acuminate, sometimes sparingly pubescent, the pleated margin inflexed and tomentose; stamens 15.5–19 mm long, adnate 7–9 mm, the adnate portion pubescent for the basal 3–4 mm, free part 7.5–9.5 mm, the insertion geniculate-tumid, 1.5–2.5 mm long; anthers orbicular, 1 mm across; ovary lobed, 0.7 diam., glabrous, papillose 4–5 mm below the stigma, exceeding the stamens by 1.5 mm; style 15–19 mm, stigma subcapitate, slightly bilobed, included; ovules 16–18. Fruit not seen.

*Cestrum ruizteranianum* is found in cloud forest ravines in the Venezuelan Andes at elevations of 2500–2900 m.

This species is named in honor of Luis Ruíz-Terán, a botanist who for many years collected interesting plants in Andean northwestern Venezuela.

As a herbarium specimen, this species resembles showy yellow-flowered species from upland Central America, e.g., *C. laxum* Bentham, but the flowers are reported as pale green and purple. It differs also in its glandular calyx.

Although three collections are cited, they were made the same day by the same collecting party, perhaps at the same place.

*Paratypes.* VENEZUELA. **Mérida:** Distrito Rangel, Gavidia, orillas del camino entre el Hato de La Escalera y el puente sobre la quebrada La Escazes, 2550–2950 m, 1 Nov. 1978 (fl), *Ruíz-Terán et al. 16171* (MERF, MY), *16154* (MY).

*Cestrum strigilatum* is one of the most widespread species of *Cestrum.* It ranges from coastal Brazil and northern Argentina to Costa Rica, occurring from sea level to about 1600 m. In his monograph of the genus, Francey (1935) used the later name *C. calycinum* for this species. His rationale for use of names of Willdenow in Roemer and Schultes (1819) instead of those of Kunth (1818) was stated on p. 142 of the monograph, which cites Kuntze's *Revisio Generum* and Sendtner in *Flora Brasiliensis.* Some of the following synonymy was expressed by D'Arcy (1972) and Cabrera (1983), but not by Smith and Downs (1966). We have chosen not to lectotypify the species at this time.

Francey included *Cestrum lundianum* Dunal (in DC., Prodr. 13(1): 658) in synonymy under this species. Photographs of the type (Brazil, São Paulo,

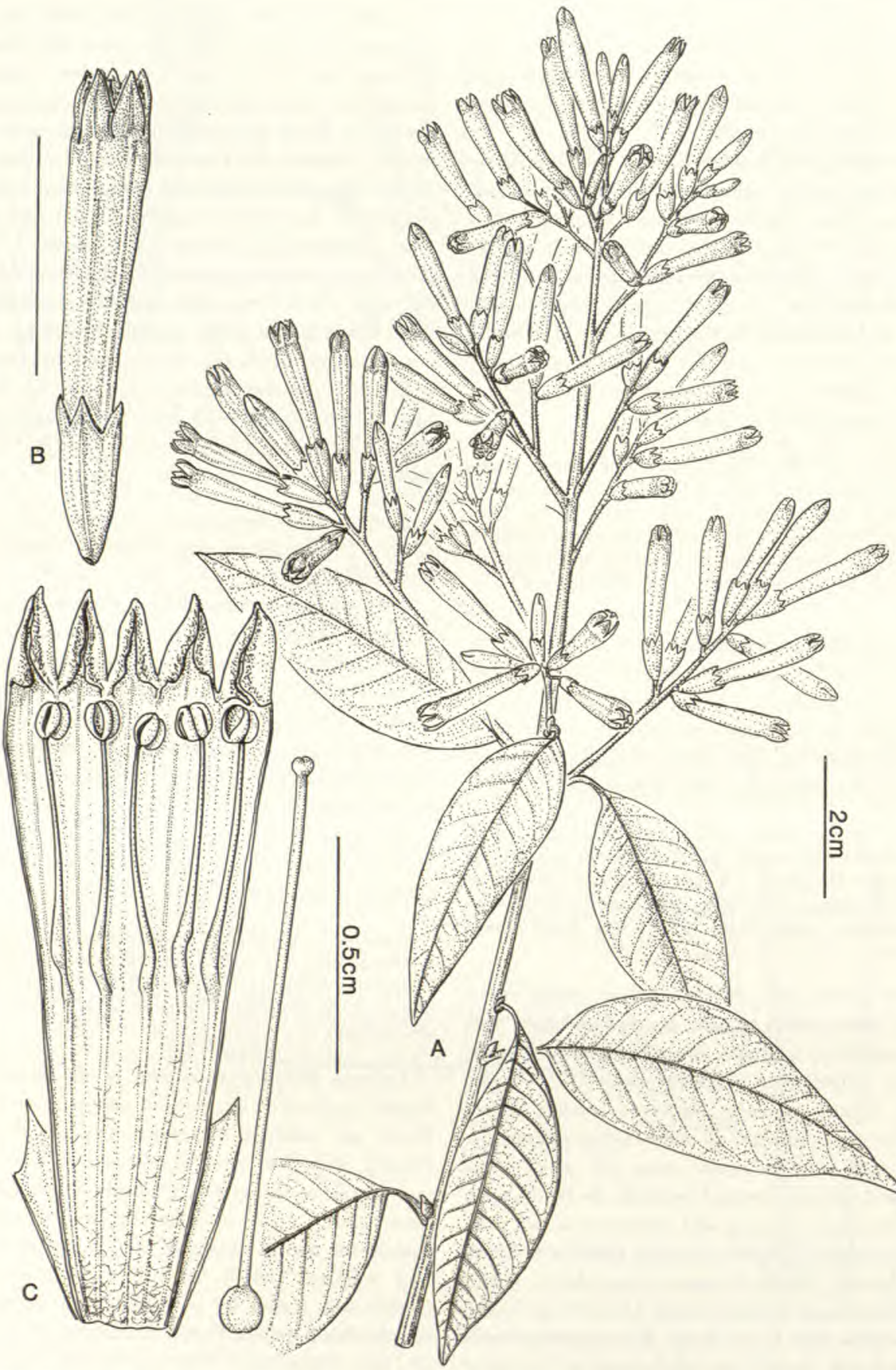


Figure 2. *Cestrum ruizteranianum* Benítez & D'Arcy. —A. Flowering branch. —B. Flower. —C. Flower opened longitudinally showing corolla, anthers, and pistil. (After *Luteyn 6191.*)

*Lund 134* (G-DC, -IDC microfiche, =F photo 006898 (MO))) did not permit verification, but its identity with *C. strigilatum* seems unlikely.

**Cestrum strigilatum** Ruiz & Pavón, Fl. Peruv. 2: 29, t. 156. 1799. TYPE: Peru. Nemoribus versus Pozuzo, Chinchao et Cuchero vicos, *Ruiz & Pavón s.n.* (holotype, M; isotypes, B, HAL, fide Francey, neither seen, F photo of element once at B, 018394).

*Cestrum calycinum* Kunth, Nov. Gen. Sp. 3: 58. 1818. TYPE: Peru. Prope Gonzanama, 1180 hex, *Bonpland* (B-W 4461 not seen, microfiche). Synonymized by D'Arcy (1974); Cabrera (1983: 471).

*Cestrum viridiflorum* Hooker, Bot. Mag. t. 4022. 1843. TYPE: Brazil. Porto Alegre, *Tweedie* (K). Synonymized by Francey (1935: 137); Cabrera (1983: 471).

*Cestrum unibracteatum* Dunal in DC., Prodr. 13(1): 656. 1852. SYNTYPES: Peru. Sylvis Cochero, *Dombey s.n.* (G-DC, MPU, neither seen), *Poeppig s.n.* (sub "*96 C. longium*, Ruiz & Pavón 1246") (G-DC not seen, =IDC microfiche, F photo 006899 MO). Synonymized by Francey (1935: 142).

*Cestrum unibracteatum* var. [β] *brachystachys* Dunal in DC., Prodr. 13(1): 657. 1852. TYPE: Brazil. Circa Cujaba ubique, *da Silva Manso 34* (G-DC not seen, =IDC microfiche, =F photo 023178 MO). Synonymized by Francey (1935: 142).

*Cestrum cancellatum* Dunal in DC., Prodr. 13(1): 657. 1852. TYPE: Peru. *Poeppig 3080* (G-DC not seen, =IDC microfiche, =F photo of B, not extant 002969 MO).

*Cestrum strigilatum* (*strigillatum*) var. [α] *laxiflorum* Kuntze, Rev. Gen. Pl. 3: 220. 1893. SYNTYPES: Argentina. Salta: Orán, *Lorenz & Hieronymus s.n.* (NY); Bolivia. Cochabamba: Yungas "Juntas," *Kuntze s.n.* (NY). Synonymized by Francey (1935: 142); Cabrera (1983: 471).

*Cestrum calycinum* Kunth, Nov. Gen. Sp. 3: 58. 1818. *Cestrum strigilatum* (*strigillatum*) var. [β] *calycinum* (Kunth) Kuntze, Rev. Gen. Pl. 3: 220. 1893. SYNTYPES: Bolivia. Matto Grosso: West-Velasco bis Tunarigebirge, 200–2400 m, collector not named.

*Cestrum impressum* Rusby, Bull. New York Bot. Gard. 4: 425. 1905. TYPE: Bolivia. La Paz: *Bang 2516* (NY not seen). Synonymized by Francey (1935: 137); Smith & Downs (1966: 230).

*Sessea rugosa* Rusby, Bull. New York Bot. Gard. 8: 119. 1912. TYPE: Bolivia. Apolo, 4800 ft., *R. S. Williams 2449* (NY not seen). Synonymized by Francey (1935: 142).

*Cestrum calycinum* var. *tenuiflorum* Francey, Candollea 6: 142. 1935. Syn. nov. SYNTYPES: Paraguay. Villa Encarnación, *Bettfreund 131*; Argentina. Yaguara-Zapa, *Niederlein 268b* (G not seen, F photo 002998 MO).

*Cestrum strigilatum* var. *tenuiflorum* Francey, Candollea 6: 144. 1935. Syn. nov. SYNTYPES: Ecuador. Balao, *Eggers 14274* (lectotype, designated here, W; isolectotype, US fragment). Guayaquil, *Jameson 57* (B, M, W, none seen).

*Cestrum aristeguietae* Steyermark, Acta Bot. Venez. 6(1–4): 86. 1971. TYPE: Venezuela. Carabobo: wooded slopes along Río San Gian, 2 km below Planta Eléctrica, S of Borburata, alt. 350 m, *J. & C. Steyermark 95463* (holotype, VEN; isotypes, NY, P, US).

*Cestrum longifolium* Ruiz & Pavón ex Dunal in DC., Prodr. 13(1): 657. 1852. Invalid name, cited in synonymy of *C. unibracteatum*.

**Cestrum tillettii** Benítez & D'Arcy, sp. nov. TYPE: Venezuela. Zulia: Distrito Perijá, headwaters of Río Guasare, Sierra de Perijá, Serranía de Valledupar, environs of Campamento Frontera V, along international boundary, 2700–3300 m, 10°23′07.8″N, 72°52′42.5″W, 10–19 July 1974 (fl), *Tillett 747–1021* (holotype, MY; isotypes, AAU, MO, MYF, VEN). Figure 3.

Arbor 2–3 *m* alta, foliis glabris coriaceis, marginibus revolutis, foliis minoribus carentibus. Inflorescentia axillaris, congesta, tomentosa. Flores fragrantes diurni castanei, sessiles, calyce viride apice purpureo tubuloso, corolla 15–18.5 mm longa, staminibus 10–13 mm longis, geniculatis tumidisque ad insertionem; ovula 5. Fructus ovoideus 9 × 6 mm.

Tree 2–3 m tall; stems brown, glabrous, striate and scarred. Leaves firm, subcoriaceous, narrowly elliptical, basally narrowly cuneate, slightly acute near the top, the tip obtuse, 4–6 × 1.3–1.5 cm, dark green, shiny above, dull green beneath, the major veins sunken above, salient beneath, 6–8 on each side, the minor veins impressed beneath, the margin revolute, glabrous on both sides; petiole canaliculate, 3–7 mm long, glabrous. Minor leaves wanting. Inflorescences axillary, congested, the main axes tomentose, bright matte green, 1.5–3 cm long, the peduncles 5–7 mm long, pubescent, thickened, with circular scars from fallen flowers, flowers few per node. Flowers sessile (pedicels obsolete) with faint, sweet fragrance during the day; calyx yellow-green, flushed distally with dark purple, tubular, thick, costate, the costas especially conspicuous distally, slightly pubescent outside with hairs slightly thickened near the base, 4.5–5.5 mm long, 2–2.5 mm thick, 5-lobate, the lobes 1.5–2.5 mm long, narrowly triangular, the apex pubescent; corolla 15–18.5 mm long, the tube 13–16 mm long, slightly expanded toward the apex, the throat not noticeably contracted, the mouth ca. 2 mm wide, 5-lobate, the lobes 2–2.5 mm long, the folded margins puberulent; stamens 10–13 mm long; filaments white, adnate 6–9 mm, free 4.5 mm, the point of insertion geniculate-tumid, slightly pilose, 1 mm long; anthers brown, spherical, 0.5 mm diam.; ovary ovoid, glabrous, smooth, 1 mm diam., 5-ovulate; style 12–13.5 mm long, papillose 1–2 mm below the stigma, exceeding the stamens by 1.5 mm; stigma green. Fruit ovoid, 9 × 6 mm, pericarp thick, opaque; seeds 6–7, 3–3.5 mm long.

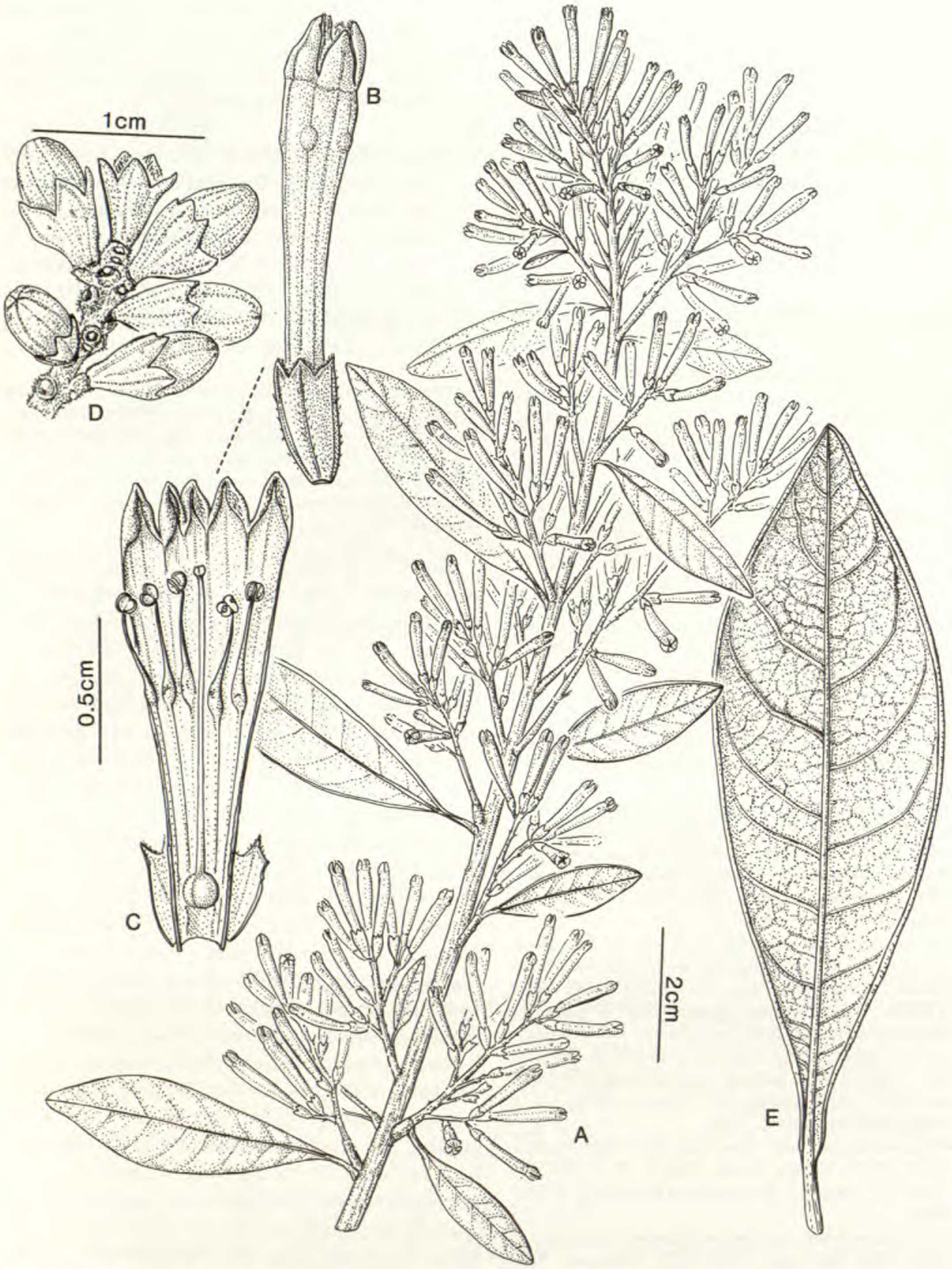


Figure 3. *Cestrum tillettii* Benítez & D'Arcy. —A. Flowering branch. —B. Flower. —C. Flower opened longitudinally. —D. Fruits. —E. Leaf, abaxial side. (A, B, C after *Tillet 747–1021*; E after *Tillet 747–929*.)

*Cestrum tillettii* occurs in cloud forests at the headwaters of rivers at elevations of 2700–3650 m. It has been found on the eastern side of the Sierra de Perijá, a mountain range shared by Venezuela and Colombia.

This species is named in honor of Stephen S. Tillett, professor in the Faculty of Pharmacy at the Universidad Central de Venezuela, Caracas. He was the leader of the expedition that collected the only known specimens of this species.

*Paratypes.* VENEZUELA. **Zulia:** Distrito Perijá, headwaters of Río Apón, Sierra de Perijá, Serranía Valledupar, Hacienda Buena Vista to N side of Cerro Laminado, ca. 5 km N of Buena Vista, along international boundary, 3300–3650 m, 10°20′23″N, 72°54′14″W, 9–10 July (fr), *Tillett & Hönig 747–929* (MY); Dist. Perijá, headwaters of Río Guasare along international boundary, "Campamento Frontera V," 2700–3300 m, 10°23′7.8″N, 72°52′45.5″W, 20–23 July (fl, fr), *Wood & Berry 88* (MO, VEN).

*Cestrum tomentosum* is one of the most widespread species of *Cestrum*, and in many places it is common, especially as a successional element, occurring from about 1000 to 2600 m elevation. The species has been collected from as far north as Sonora, Mexico, and as far south as extreme southern Peru. It is also found in northwestern Venezuela but is generally absent from the Amazon region of South America. It is a shrub or small tree, usually erect, with pubescent leaves, calyces, and corolla tubes, and it has a shiny, purple-black, fleshy fruit.

The identity of many of the names cited here was suggested by Nee (1986: 49), who also provided a good description (as *C. lanatum*).

**Cestrum tomentosum** L. f., Suppl. Pl. 150. 1781. TYPE: Colombia. *Mutis 94* (holotype, LINN 258.6 not seen, =IDC microfiche).

*Cestrum hirsutum* Jacquin, Pl. Hort. Schoenbr. 3: 41, t. 324. 1798. Syn. nov. TYPE: Indias Occidentales: cult. hort. Schoenbrunn (W, B-W 4449, not seen, =IDC microfiche, =F photo 033032 MO).

*Cestrum lanuginosum* Ruiz & Pavón, Fl. Peruv. 2: 30, tab. 157. 1799. Syn. nov. TYPE: Peru. Prov. Arequipa: Camana, collibus arenosis, *Ruiz s.n.* (lectotype, designated here, G not seen, =F photo 002984; isolectotype, F).

*Cestrum lanatum* Martens & Galeotti, Bull. Acad. Roy. Sci. Bruxelles 12(2): 146. 1845. TYPE: Mexico. Veracruz: dans les bois et haies de la colonie de Mirador, 3000 pieds, *Galeotti 1208* (holotype, BR not seen; isotypes, G, K, NY, US, W).

*Cestrum moritzii* Dunal in DC., Prodr. 13 (1): 619. 1852. Syn. nov. TYPE: Venezuela. Caracas, *Moritz 309* (holotype, G-DC not seen, =IDC microfiche, =F photo 002988; isotypes, BM, MO).

*Cestrum miersianum* Weddell, Chlor. And. 2: 97. 1857. TYPE: Colombia. Sierra Nevada de Santa Marta, 3,300 m, *Linden 1615* (holotype, G-DC not seen, =IDC microfiche).

*Cestrum miersianum* Pittier, J. Wash. Acad. Sci. 22(2): 37. 1932, not Weddell (1857). Syn. nov. TYPE: Venezuela. Mérida: San Rafael de Mucuchíes, 3150 m, *A. Jahn 767* (holotype, VEN; isotype, MO). *Cestrum neomiersianum* Benítez, Rev. Fac. Agron. (Maracay) 7: 90. 1974. New name.

*Cestrum diasae* Pittier, J. Wash. Acad. Sci. 22 (2): 29. 1932. Syn. nov. TYPE: Venezuela. Mérida: Misintá, arriba de Mucuchíes, 3500 m, *Pittier 12919* (holotype, VEN; isotype, US).

*Cestrum meridanum* Pittier, J. Wash. Acad. Sci. 22(2): 36. 1932. Syn. nov. TYPE: Venezuela. Vecinidades de Mérida, 1700 m, *Pittier 12858* (holotype, VEN; isotype, US).

*Cestrum densiflorum* Francey, Candollea 6: 195. 1935. Syn. nov. SYNTYPES: Venezuela. Mérida: entre Chachopo y Timotes, *Pittier 13294* (lectotype, designated here, NY; isolectotypes, F, MO, US, VEN); *Pittier 13323* (NY, VEN).

*Cestrum densiflorum* Francey var. *puberulum* Francey, Candollea 6: 196. 1935. Syn. nov. TYPE: Venezuela. Trujillo. San Pablo de Mendoza, *Pittier 13323* (holotype, VEN; isotype, US).

*Cestrum verbascifolium* Zuccarini ex Francey, Candollea 6: 191. 1935. Syn. nov. TYPE: cultivated in Berlin and Munich (B-W 4449 not seen, =IDC microfiche).

*Cestrum ambatense* Francey, Candollea 6: 169. 1935. Syn. nov. TYPE: Ecuador. Prov. Tungurahua: vicinity of Ambato, *Pachano 75* (holotype, NY; isotype, US fragment).

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Literature Cited

Cabrera, A. L. 1983. Flora de la Provincia de Jujuy, República Argentina. Colección Científica del INTA, Buenos Aires.

D'Arcy, W. G. 1972 [1973]. Solanaceae. *In:* R. E. Woodson et al., Flora of Panama. Ann. Missouri Bot. Gard. 60: 573–870.

Francey, P. 1935–1936. Monographie du genre *Cestrum* L. Candollea 6: 46–398; 7: 1–132.

Kunth, C. S. 1818. Solaneae. *In:* Nova Genera et Species Plantarum, Vol. 3. Paris.

Nee, M. 1986. Solanaceae. *In:* Flora de Veracruz. 49: 1–191. Inst. Nac. Invest. Recursos Biót., Xalapa.

Roemer, J. J. & J. A. Schultes. 1819. Caroli a Linné equitis Systema vegetabilium secundum classes ordines genera species, Vol. 4. Stuttgart.

Smith, L. B. & R. J. Downs. 1966. Solanáceas. Parte I. *In:* P. R. Reitz (editor), Flora Illustrada Catarinense. Herbário "Barbosa Rodrigues," Itajai, Santa Catarina, Brazil.

# Two New Species of *Fuchsia* Section *Fuchsia* (Onagraceae) from Southern Ecuador

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ABSTRACT. Two new species of *Fuchsia* sect. *Fuchsia* (Onagraceae) from the Andes of southern Ecuador are described and illustrated. *Fuchsia campii* P. E. Berry is known from mid-elevation cloud forest of Azuay and Loja Provinces, and *Fuchsia summa* P. E. Berry is a high-elevation species currently known only from Loja Province. Both occur in Podocarpus National Park, together with several other rare species of *Fuchsia*.

Studies and collections of plants from southern Ecuador have increased dramatically in the past decade, especially in areas such as Podocarpus National Park in Loja Province. Many novel plants have been located, and this paper describes two new species of *Fuchsia* that occur in cloud forest areas on the slopes of Cerro Toledo, one of them also known further north in Azuay Province. Three other species previously thought to be extremely rare in southern Ecuador are also known from Cerro Toledo: *F. andrei* I. M. Johnston, *F. scherffiana* André, and *F. steyermarkii* P. E. Berry. All these taxa belong to the largest section of the genus, section *Fuchsia*, which now approaches 65 species. They are also examples of the high degree of local endemism in cloud forests of southern Ecuador, where moist montane habitats are often separated by dry valleys and show a wide range of precipitation regimes.

**Fuchsia campii** P. E. Berry, sp. nov. TYPE: Ecuador. Azuay: Quebradas leading into the Río Collay, 3–8 km N of Sevilla de Oro, 7000–8300 ft., 27 Aug. 1945, *W. H. Camp E-4994* (holotype, RSA herbarium # 71952; isotypes, G-DEL, MO, NY, UC, US). Figure 1.

Frutex 1.5–4 m altus, foliis 3-vel 4-verticillatis, interdum oppositis, 3–9 × 1–3 cm, margine subintegro vel 7–10-dentato, floribus axillaribus apicem versus, pedicellis 18–30 mm longis, tubo florali roseo 29–45 mm longo, sepalis lanceolatis 12–15 mm longis, petalis auriantiacis 8–11 mm longis, 4–6 mm latis.

Erect to recumbent shrub 1.5–4 m tall, well branched with mostly ascending branches; young growth pubescent, the trichomes 0.1–0.5 mm long, appressed to erect; branchlets terete to slightly angled, older branches with purplish, exfoliating bark. Leaves mostly in whorls of 3 or 4, sometimes opposite or subopposite; blade membranous, narrowly elliptic, 3–9 cm long, 1–3 cm wide, acute to acuminate at the apex, acute at the base, subglabrous to sparsely strigose when young on both surfaces and margin, trichomes persisting mainly along the midvein and secondary nerves on lower surface when fully expanded, upper surface smooth, shiny, and light to dark green, lower surface paler green; margin nearly entire, usually with 7–10 glandular teeth projecting slightly from the edge especially in the upper ½ to ⅔ of the blade; secondary nerves (5–)8–10 on either side of the midvein; petiole strigose, (4–)6–25 mm long; stipules narrowly lanceolate when young, 1–1.5 mm long, ca. 0.2 mm wide, the tip quickly abscising and the thicker lower third persisting or abscising later. Flowers axillary in the upper leaf axils, 2–several per node, pedicel 18–30 mm long; floral tube narrowly funnelform, (29–)32–45 mm long, 2.5–3.5 mm wide at the base, narrowed to 2–2.5 mm wide in the lower ¼, then gradually widened until 5–8 mm wide at the rim, sparsely strigose outside, densely pubescent inside in the lower narrowed portion; nectary a doughnut-shaped ring 1–2 mm high and 2–3 mm wide at the base of the tube surrounding the style; ovary 4-angled, 5–6 mm long, 2–3 mm thick; sepals narrowly triangular or lanceolate, 12–15 mm long, 4–5 mm wide at the base; petals elliptic to obovate, 8–11 mm long, 4–6 mm wide, broadly acute at the apex, sometimes with a small mucro; tube and sepals bright pink except for the green sepal tips, petals orange and darker than the tube; style pink, 40–64 mm long, densely pubescent in lower third, stigma pink, capitate, ca. 2 mm high, ca. 2.5 mm wide; filaments 10–12 mm and 7–9 mm long, anthers oblong, 2–3 mm long, 1–1.5 mm wide. Fruit oblong-ellipsoid before maturity, subrotund when ripe, 9–15 mm long, 5–9 mm thick; seeds flattened, obtriangular in outline, 1.8–2.2 mm long, 1.2–1.6 mm wide, ±200 per fruit. Gametic chromosome number $n = 11$.

*Ecology and distribution.* Occurring in thickets, along streams, and along roadsides in pasture zones on moist mountain slopes, 2300–2700 (–3350) m, in Azuay and Loja Provinces, Ecuador.

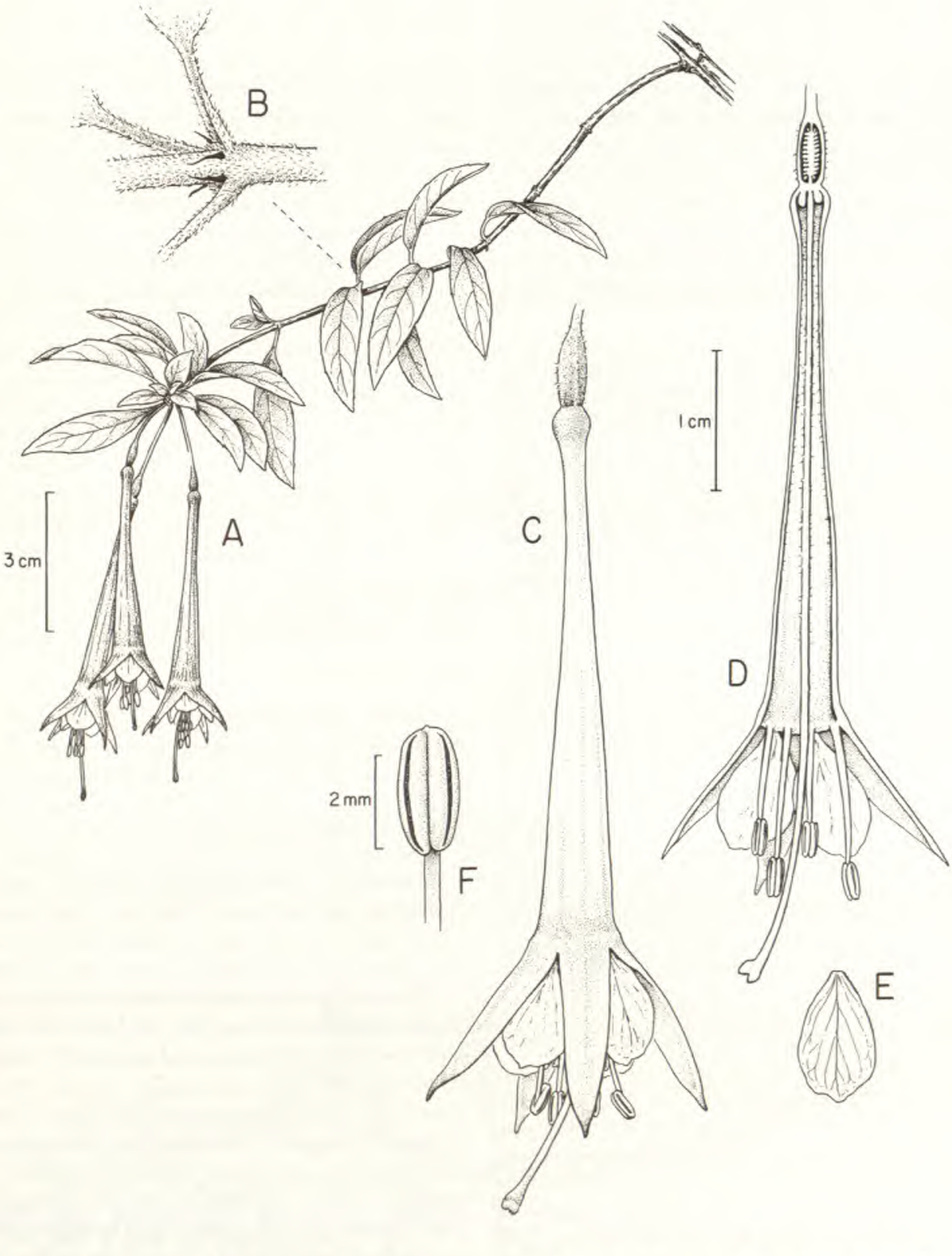


Figure 1. *Fuchsia campii* P. E. Berry. —A. Habit. —B. Detail of stipules. —C. Flower at anthesis. —D. Flower in longitudinal cross section. —E. Petal. —F. Anther. Drawn from *Berry & Brako 4646*.

*Etymology.* Named for Wendell H. Camp (1904–1963), a botanist who made extensive plant collections in southern Ecuador for the New York Botanical Garden in the mid 1940s.

The type specimen of *Fuchsia campii* was treated by Munz (1974) under *Fuchsia ayavacensis* HBK, but that species has wider and shorter petals, larger and more pubescent leaves, and occurs in drier habitats in southern Ecuador and in northern Peru. One of the paratypes cited here (*Camp E-4257*) was listed by Munz under *F. canescens* Bentham, but that species is confined to southern Colombia and

has thick, firm flowers, short pedicels, trowel-shaped petals, tetragonous sepals in bud, and mostly 4-whorled leaves. *Fuchsia campii* might be confused with *F. vulcanica* André (sensu lato) but differs in its narrower, orange petals contrasting with the pink floral tube and sepals (the sepals also turn green toward the apex) and in the narrower leaves with margins entire or else with small teeth. It is apparently diploid, as chromosome counts of $n = 11$ and $2n = 22$ were obtained from *Escobar 1543*, and three collections identified as *F. vulcanica* from Azuay Province were tetraploid (Berry, 1982).

*Paratypes.* ECUADOR. **Azuay:** E Cordillera, 1–8 km N of the village of Sevilla de Oro, 8000–9000 ft., 27 July 1945, *Camp E-4257* (NY, RSA); quebradas leading into the Río Collay, 3–8 km N of Sevilla de Oro, 7000–8000 ft., 27 Aug. 1945, *Camp E-4994* (MO); Partidero Llantera-Chiquintad-Saucay-Guandum, 10,000 ft., 27 May 1979, *Jaramillo 1068* (AAU, QCA). **Loja:** road from Yangana to Cerro Toledo, 2360 m, 13 Nov. 1988, *Berry & Brako 4646* (MO, QCA); between Yangana and Toledo, 7700–8000 ft., 26 July 1979, *Escobar 1543* (MO, TEX), *1544* (MO, TEX), *1545* (MO, TEX).

**Fuchsia summa** P. E. Berry, sp. nov. TYPE: Ecuador. Loja: shrub patches in open páramo above tree line, road from Yangana to Cerro Toledo, 3150 m, 13 Nov. 1988, *P. E. Berry & L. Brako 4644* (holotype, MO; isotypes, QCA, US). Figure 2.

Frutex 30–100 cm altus, ramulis erectis foliis apicem versus congestis 3-vel 4-verticillatis, 15–35 mm longis, petiolis 5–8 mm longis. Flores axillares, 4-angulati, pedicellis 4–7(–10) mm longis, tubo florali 18–26(–32) mm longo, sepalis 10–14 mm longis, petalis suborbicularibus 8–12 × 7–9 mm.

Erect shrub 30–100 cm tall; branches erect, mostly bare except for the leafy tips, with short internodes mostly 6–12(–25) mm long and protruding leaf base scars, branchlets appressed-pubescent with whitish trichomes. Leaves mostly in whorls of 3 or less often 4, densely clustered at the stem apices; blade subcoriaceous, broadly elliptic, 15–35 mm long, 12–18 mm wide, broadly to narrowly acute or rounded at the apex and base, usually with scattered appressed trichomes along the midvein on both surfaces, upper surface dark green, lower surface paler green; margin gland-denticulate with trichomes between the teeth; secondary nerves 4–6 on either side of the midvein; petiole 5–8 mm long; stipules narrowly lanceolate, 1–2 mm long, 0.3–0.5 mm wide. Flowers axillary and pendent in the upper leaf axils, 2–several per node, pedicel 4–7 mm long in flower, to 10 mm long in fruit; floral tube narrowly funnelform, 18–26(–32) mm long, 2–2.5 mm wide at the base, 4–6 mm wide at the rim, 4-angled in cross section, appressed-pubescent to nearly glabrous in the lower half outside, densely villous in lower half inside; nectary a doughnut-shaped ring ca. 1.5 mm high and 2 mm wide at the base of the tube surrounding the style; ovary 4-angled, 5–6 mm long, 2–3 mm thick; sepals broadly elliptic, acute to subacuminate at the apex, 10–14 mm long, 5–6 mm wide at the base, quadrangular in cross section when joined before opening; petals suborbicular, slightly spreading, 8–12 mm long, 7–9 mm wide, broadly acute to mucronate at the apex, broadly acute to spathulate at the base; tube pale red, sepals pale green in bud but becoming flushed with red by anthesis, petals slightly darker red than the tube; style red, 28–35 mm long, villous in lower half, stigma pink, capitate, ca. 2 mm high by 2 mm wide; filaments 5–7 mm and 4–5 mm long, anthers broadly oblong, ca. 2 mm long and 1.5 mm wide. Fruit 4-angled before fully mature, 9–12 mm long, ca. 5 mm thick; seeds flattened, obtriangular in outline, 1.9–2.1 mm long, ca. 1.5 mm wide.

*Ecology and distribution.* Occurring in low shrub patches among open grassy areas at and above tree line, on very humid upper slopes of Cerro Toledo east of Yangana in Loja Province, Ecuador, 3100–3450 m elevation.

*Etymology.* From the Latin *summus,* meaning highest or uppermost, in reference to this species occurring at tree line and at higher elevations than any other species of *Fuchsia* on the same mountain.

This species forms small, dense thickets in exposed areas close to tree line. Its leaves are small, with few secondary veins, and are tightly congested toward the stem apices. The flowers are distinctive in their short pedicels that angle sharply downward alongside the stems and in the strongly quadrangular ovary, floral tube, and sepals in bud. *Fuchsia summa* appears to be morphologically most similar to *F. loxensis* HBK, a broadly circumscribed species in Berry (1982). Besides the characters listed above, *F. summa* differs in the greenish coloration of the sepals and generally more pubescent flowers.

*Paratypes.* ECUADOR. **Loja:** road from Yangana to Cerro Toledo, 3140 m, 12 Nov. 1988, *Berry & Brako 4643* (MO, QCA); Cerro Toledo, Parque Nacional Podocarpus, 3000–3400 m, 27 Nov. 1988, *Madsen 75617* (AAU, MO), 1 Dec. 1988, *Madsen et al. 75640* (AAU), 21 July 1989, *Madsen et al. 86119* (AAU, MO), 30 Oct. 1989, *Madsen 86320* (AAU), 30 Oct. 1989, *Madsen 86343* (AAU); Cerro

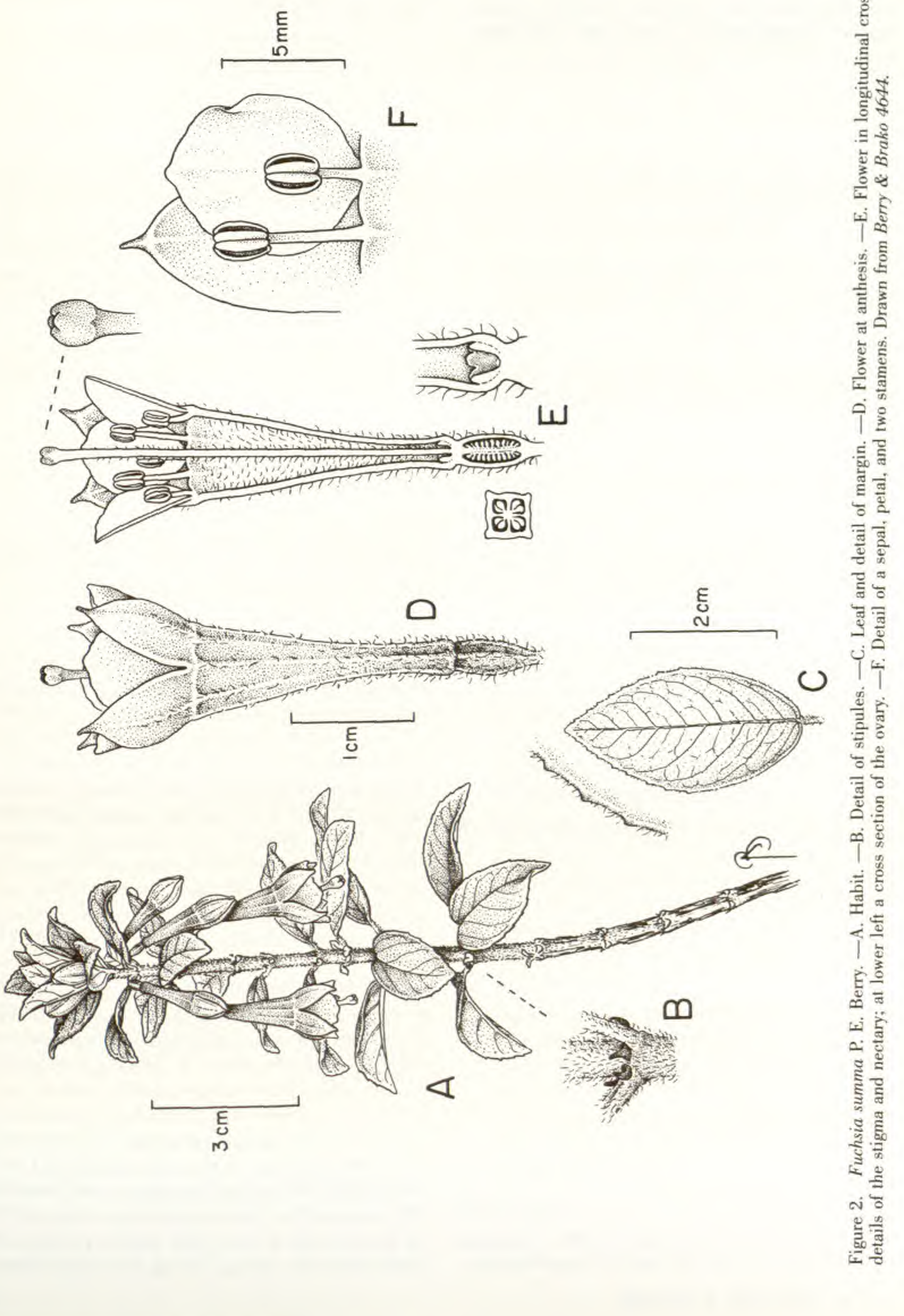


Figure 2. *Fuchsia summa* P. E. Berry. —A. Habit. —B. Detail of stipules. —C. Leaf and detail of margin. —D. Flower at anthesis. —E. Flower in longitudinal cross section with details of the stigma and nectary; at lower left a cross section of the ovary. —F. Detail of a sepal, petal, and two stamens. Drawn from *Berry & Brako 4644*.

Toledo E of Yangana, Parque Nacional Podocarpus, 3400–3450 m, 26 Feb. 1985, *Øllgaard et al. 58186* (AAU).

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Literature Cited

Berry, P. E. 1982. The systematics and evolution of *Fuchsia* sect. *Fuchsia* (Onagraceae). Ann. Missouri Bot. Gard. 69: 1–198.

Munz, P. A. 1974. Flora of Ecuador. 141. Onagraceae. Opera Bot. Ser. B no. 3, 3–46.

# New Combinations in *Chamaesyce* (Euphorbiaceae) from Queensland, Australia

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ABSTRACT. The new combinations *Chamaesyce carissoides* (F. M. Bailey) D. C. Hassall ex P. I. Forster & R. J. F. Henderson, *C. centralis* (B. G. Thompson) P. I. Forster & R. J. F. Henderson, *C. coghlanii* (F. M. Bailey) D. C. Hassall ex P. I. Forster & R. J. F. Henderson, *C. petala* (Ewart & L. R. Kerr) P. I. Forster & R. J. F. Henderson, and *C. psammogeton* (P. S. Green) P. I. Forster & R. J. F. Henderson are made.

Recognition of *Chamaesyce* S. F. Gray as a genus distinct from *Euphorbia* L. has received considerable support (e.g., Hassall, 1976; Koutnik, 1984, 1987; Smith, 1981; Webster, 1994) or rejection (e.g., Radcliffe-Smith, 1980; McPherson & Tirel, 1987; Oudejans, 1990) among taxonomists. Revisions of *Chamaesyce* and *Euphorbia* s. str. in Australia were undertaken by Hassall (1977a). These were unfortunately never published in full; only a revision of the latter genus (Hassall, 1977b), valid transfers of some names into *Chamaesyce* (Hassall, 1976), and discussion of arid zone speciation patterns (Hassall, 1982) appeared in print.

Recognition of *Chamaesyce* in Australia subsequent to Hassall's work has not been widespread, with most authors opting for a broadly circumscribed *Euphorbia* (e.g., Forster, 1993, 1994; 0Green, 1993; Forster & Henderson, 1994; Thompson, 1992; Weber, 1986; Wheeler, 1987) as opposed to the narrower view of James and Harden (1990). Despite this lack of local support, we are now of the opinion that the arguments proposed by Hassall (1976), Koutnik (1984, 1987), and Webster (1994) for recognizing *Chamaesyce* as a genus in its own right are convincing and that their views should be supported. As a new edition of "Queensland Vascular Plants Names and Distribution" the Queensland Herbarium (BRI) census of Queensland Plants in which the authors intend to recognize *Chamaesyce* as a distinct genus is soon to be prepared, new names are required for certain taxa. While valid combinations exist in *Chamaesyce* for the majority of taxa that occur in Queensland, no combinations exist for five species. Therefore, these combinations are made here. Two of these combinations were listed in the unpublished thesis of Hassall (1977a) but never published.

1. **Chamaesyce carissoides** (F. M. Bailey) D. C. Hassall ex P. I. Forster & R. J. F. Henderson, comb. nov. Basionym: *Euphorbia carissoides* F. M. Bailey, Queensland Agric. J. 16: 449. 1906. TYPE: Australia. Queensland: Cook District, Herberton, *Ringrose* [AQ342536] (holotype, BRI).

2. **Chamaesyce centralis** (B. G. Thompson) P. I. Forster & R. J. F. Henderson, comb. nov. Basionym: *Euphorbia centralis* B. G. Thompson, Nuytsia 8: 353. 1992. TYPE: Australia. Northern Territory: 3 km SW of Alice Springs, 18 Jan. 1990, *Thompson 3408* (holotype, DNA not seen; isotypes, BRI; AD & CANB not seen).

3. **Chamaesyce coghlanii** (F. M. Bailey) D. C. Hassall ex P. I. Forster & R. J. F. Henderson, comb. nov. Basionym: *Euphorbia coghlanii* F. M. Bailey, Bot. Bull. 13: 12. 1896. TYPE: Australia. Queensland: Gregory North District, Roxborough, Georgina River, Dec. 1895, *Bailey* [AQ342538] (holotype, BRI).

4. **Chamaesyce petala** (Ewart & L. R. Kerr) P. I. Forster & R. J. F. Henderson, comb. nov. Basionym: *Euphorbia petala* Ewart & L. R. Kerr, Proc. Roy. Soc. Victoria, New Series 39(1): 1. 1926. TYPE: Australia. Northern Territory: Wycliffe Well, June 1924, *Ewart* (holotype, MEL not seen).

5. **Chamaesyce psammogeton** (P. S. Green) P. I. Forster & R. J. F. Henderson, comb. nov. Basionym: *Euphorbia psammogeton* P. S. Green, Kew Bull. 48: 314. 1993. TYPE: Australia. Lord Howe Island: Blinky Beach, 13 Nov. 1963, *Green 1625* (holotype, K not seen; isotype, A not seen).

Literature Cited

Forster, P. I. 1993. Rediscovery of *Euphorbia carissoides* (Euphorbiaceae). Austral. Syst. Bot. 6: 269–272.

———. 1994. Tropical beaches and *Euphorbia atoto* in Australia and Papuasia. Cact. Succ. J. (U.S.) 66: 7–10.
——— & R. J. F. Henderson. 1994. Euphorbiaceae. Pp. 107–117 *in:* R. J. F. Henderson (editor), Queensland Vascular Plants: Names and Distribution. Queensland Department of Environment & Heritage, Brisbane.
Green, P. S. 1993. Notes relating to the floras of Norfolk & Lord Howe Island, IV. Kew Bull. 48: 307–325.
Hassall, D. C. 1976. Numerical and cytotaxonomic evidence for generic delimitation in Australian Euphorbieae. Austral. J. Bot. 24: 633–640.
———. 1977a. Systematic studies in Australian Euphorbieae (Euphorbiaceae). Doctor of Philosophy Thesis, University of Queensland. St Lucia, Brisbane.
———. 1977b. The genus *Euphorbia* in Australia. Austral. J. Bot. 25: 429–453.
———. 1982. Distribution and evolution of *Euphorbia* and *Chamaesyce* (Euphorbiaceae) in the arid zone of Australia. Pp. 323–328 *in* W. R. Barker & P. J. M. Greenslade (editors), Evolution of the Flora and Fauna of Arid Australia. Peacock Publications, Frewville.
James, T. A. & G. J. Harden. 1990. Euphorbiaceae. *In:* G. J. Harden (editor), Fl. New South Wales 1: 389–430. Univ. New South Wales Press, Sydney.
Koutnik, D. L. 1984. *Chamaesyce* (Euphorbiaceae)—A newly recognised genus in southern Africa. S. African J. Bot. 3: 262–264.
———. 1987. A taxonomic revision of the Hawaiian species of the genus *Chamaesyce* (Euphorbiaceae). Allertonia 4: 331–388.
McPherson, G. & C. Tirel. 1987. Flore de la Nouvelle-Calédonie et Dépendences. 14. Euphorbiaceae I. Muséum National D'Histoire Naturelle, Paris.
Oudejans, R. C. H. M. 1990. World Catalogue of Species Names Published in the Tribe Euphorbieae (Euphorbiaceae), With Their Geographical Distribution. R. C. H. M. Oudejans, Utrecht.
Radcliffe-Smith, A. 1980. *Euphorbia. In:* A. K. Airy Shaw, The Euphorbiaceae of New Guinea. Her Majesty's Stationery Office, London.
Smith, A. C. 1981. Euphorbiaceae. *In:* Fl. Vit. Nova 2: 439–575. Pacific Tropical Botanical Gardens, Lawai.
Thompson, B. G. 1992. Three new species of *Euphorbia* L. subgenus *Chamaesyce* Rafinesque (Euphorbiaceae) from central and northern Australia. Nuytsia 8: 351–360.
Weber, J. Z. 1986. Euphorbiaceae. *In:* J. P. Jessop & H. R. Toelken (editors), Fl. South Australia 2: 735–768. Government Printer, Adelaide.
Webster, G. L. 1994. Synopsis of the genera and suprageneric taxa of Euphorbiaceae. Ann. Missouri Bot. Gard. 81: 33–144.
Wheeler, J. R. 1987. Euphorbiaceae. *In:* N.G. Marchant et al., Fl. Perth Region, 444–455. Western Australian Herbarium, South Perth.

# *Gladiolus somalensis* (Iridaceae), a New Species from Northeastern Somalia

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ABSTRACT. *Gladiolus somalensis* is a new species restricted to the limestone escarpments of the Sanaag and Bari Regions of northeastern Somalia. Although *Gladiolus* is the largest genus of Iridaceae subfamily Ixioideae and has some 83 species in tropical Africa, only 4 species occur in Somalia and only *G. somalensis* is endemic there. The affinities of this new species are uncertain, but the relatively small flowers with a short perianth tube appear to place the species in subgenus *Gladiolus*, a taxon that is most diverse and speciose in southern Africa.

The Old World genus *Gladiolus*, a member of Iridaceae subfamily Ixioideae and one of the larger, if not the largest genus of the family, consists of some 250 species (Goldblatt, in press; Goldblatt & Manning, ms.). The center of *Gladiolus* in terms of species numbers and taxonomic diversity is temperate southern Africa, more particularly the winter rainfall region of southern Africa (Lewis et al., 1972; Goldblatt, 1991). The genus is, however, well represented in tropical Africa, where some 83 species occur south of the Sahara and north of the borders of Namibia, Botswana, and South Africa (Goldblatt, in press), 75 of them endemic. At least 150 species occur in southern Africa (Goldblatt & Manning, in prep.), another 8 in Madagascar (Goldblatt, 1989), and perhaps 10 more in Europe, North Africa, and the Middle East. Here we describe a new species of *Gladiolus* restricted to northeastern Somalia, one of only four species of the genus recorded from that country, and the only one endemic there (Goldblatt, 1995).

Although first collected in 1956, *Gladiolus somalensis* remained until now too poorly known to be described or even assigned with confidence to genus. The type collection made in January 1995, however, is well preserved, and is accompanied by photographs and spirit material. This has made it possible to draw up a description, formally name the species, and have an illustration made.

**Gladiolus somalensis** Goldblatt & Thulin, sp. nov. TYPE: Somalia. Sanaag Region, escarpment S of Laasqoray, near Ragad, 11°00′N, 48°29′E, evergreen bush on limestone, 16 Jan. 1995, *Thulin, Dahir & Hassan 9079* (holotype, UPS). Figure 1.

Plantae (7–)12–30 cm altae, cormo ca. 12 mm in diametro, foliis 4–5 linearibus (1–)2–4 mm latis, spica 2–10 florum, bracteis externis viridibus (7–)12–17(–23) mm longis internis minoribus, flos aurantiacus, tepalis lateralibus infernis infra flavis (raro tepalo inferiore infra flavo), tubo perianthii infundibuliformi 6–8 mm longo, tepalis lanceolatis tribus supernis majoribus 16–18 × ca. 8 mm, infernis 12–15 × 5–5.5 mm, filamentis 8–10 mm longis, antheris 3–5 mm longis, ramis styli filiformibus ca. 2.5 mm longis.

Plants (7–)12–30 cm high. *Corm* obconic, ca. 12 mm diam., the tunics of softly textured layers, these decaying with age into fine netted fibers. *Leaves* four or five, the lower three basal and longest, reaching at least to the base of the spike and one or more often slightly exceeding the spike, the blades ± linear, (1–)2–4 mm wide, the upper one or two leaves inserted on the lower half of the stem, smaller than the basal leaves. *Stem* erect, simple or with one or two branches, ca. 1.2 mm diam. below the base of the spike. *Spike* lightly flexuose, 2–10-flowered; *bracts* green and soft-textured, the outer (7–)12–17(–23) mm long, the inner about two-thirds as long as the outer. *Flowers* zygomorphic, orange, the lower lateral tepals (rarely the lower median tepal) bright yellow in the lower half; *perianth tube* funnel-shaped, 6–8 mm long; *tepals* unequal, lanceolate, the upper three larger than the lower, the dorsal inclined over the stamens, 16–18 × 8 mm, the upper laterals about as long, the lower tepals ± parallel to the ground, the lower lateral

Figure 1. *Gladiolus somalensis* Goldblatt & Thulin (from *Thulin, Dahir & Hassan 9079*). Scale: approximately life size. (Drawn by John C. Manning.)

tepals ca. 15 × 5.5 mm, the margins raised below and the surface channeled in the lower half, the lower median ca. 12 × 5 mm, not normally channeled. *Filaments* 8–10 mm long, exserted 4–6 mm from the tube; *anthers* 3–5 mm long, yellow. *Ovary* ovoid, 2–3 mm long; *style* arching over the stamens, dividing ca. 1.5 mm beyond the anther apices, the branches ca. 2.5 mm long, filiform, evidently not expanded apically. *Capsules* and *seeds* unknown.

Flowering January and February.

## Distribution and Habitat

Still poorly known, *Gladiolus somalensis* appears to be restricted to the limestone escarpments of the Sanaag and Bari Regions facing the Gulf of Aden in northeastern Somalia. In the type locality, in the eastern part of the Cal Madow Range in Sanaag, only a single plant was seen despite extensive searching. This was growing in evergreen bushland dominated by *Buxus hildebrandtii* Baillon (Buxaceae), a native boxwood, and *Cadia purpurea* Forsskal (Fabaceae) at 1350 m elevation. *Gladiolus schweinfurthii* Baker, a species of moderate elevations in Eritrea, Ethiopia, and Kenya, is a fairly common and conspicuous plant in the area. Cal Madow is a major center of endemism in Somalia, described in detail by Thulin (1994a).

Two early collections are referred to *Gladiolus somalensis,* both from the Cal Miskat Range in Bari Region, some 150 km to the east of the type locality. Nothing is known about the habitat of the species in this area, one that is generally drier than Cal Madow, and from where neither *Buxus* or *Cadia* is known.

## Diagnosis, Variation, and Relationships

*Gladiolus somalensis* is readily distinguished from all other tropical African species of the genus by its small, bright orange flowers with a conspicuous yellow nectar guide located on the lower lateral tepals (or sometimes, and presumably abnormally, only on the lower median tepal) and fairly short perianth tube, 6–8 mm long (Fig. 1). The flowers have a superficial resemblance to species of *Tritonia,* a genus in which most species have bright orange flowers with yellow markings on the lower tepals. A characteristic feature of most orange-flowered species of *Tritonia* is the presence of a large, tooth-like callus in the lower center of each of the lower tepals, and this feature is lacking in *G. somalensis. Gladiolus* and *Tritonia* also differ fundamentally in their seeds and in the nature of the floral bracts. The seeds of *Tritonia* are prismatic to globose, smooth, and have the vascular trace excluded (Goldblatt & Manning, 1995), and the bracts of the genus are typically fairly short, more or less membranous to scarious, and have bifurcate or trifurcate apices. The capsules and seeds of *G. somalensis* are unknown and cannot be used to assist in generic placement. The bracts, however, are relatively large, soft-textured, and green, hence quite typical of *Gladiolus.* The style branches are linear and do not appear to be apically expanded as is the case with most species of *Gladiolus,* but this minor difference in style branch structure does not seem particularly significant in relation to generic placement.

The two collections from Cal Miskat both consist of small plants up to 12 cm high with leaves 1–2 mm wide, whereas the type specimen is 30 cm high and has leaves up to 4 mm wide. *Sacco s.n.* is sterile, but the inflorescence of *Azzaroli 6* is unbranched and has only two flowers. The type, from Cal Madow, has a branched inflorescence with 10 flowers on the main axis. Also, the flowers are somewhat smaller in *Azzaroli 6* than in the type. To properly evaluate these differences further field studies are needed. For the present we think these three collections are best regarded as representing a single variable species.

The relationships of *Gladiolus somalensis* within the genus are uncertain. It bears a fair resemblance to the Ethiopian *G. calcicola* Goldblatt and to the Eritrean *G. mensensis* Baker (both subgenus *Ophiolyza*), largely because both these species have relatively small flowers and are fairly small plants with several well-developed foliage leaves (Goldblatt, in press). It is more likely that the affinities of *G. somalensis* lie with southern African species of subgenus *Gladiolus.* Members of that subgenus usually have short-tubed flowers of a size comparable to those of *G. somalensis.* Most southern African species of subgenus *Gladiolus* have ellipsoid, apically acute capsules, unlike the ovoid to oblong, apically three-lobed capsules of *G. calcicola* and *G. mensensis,* more characteristic of subgenus *Ophiolyza.* Until more is known about *G. somalensis,* especially the nature of its capsules and seeds, its affinities remain speculative at best.

Although a relationship with southern African species seems less likely because of the distance involved, there are phytogeographical connections between the Somalian region and arid parts of southern Africa (de Winter, 1974; Thulin, 1994b). In Iridaceae the distribution of *Babiana* is a striking example. One species of this largely South African genus occurs on Socotra, an island off the coast of Somalia (Lewis, 1959). Another example

involving a petaloid monocot concerns a new species of *Trachyandra* (Asphodelaceae) that grows in the same area as *Gladiolus somalensis*, but in a different habitat, crevices in shady limestone rocks (Thulin, 1995). *Trachyandra* is otherwise a mainly southern African genus with a few species extending into tropical Africa.

*Paratypes.* SOMALIA. **Bari Region:** Wadi Hantara, Candala, 6 Feb. 1956, *Azzaroli 6* (FT); Azienda Uar Mahan, Jan.–Feb. 1959, *Sacco s.n.* (FT).

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Literature Cited

Goldblatt, P. 1989. Systematics of *Gladiolus* (Iridaceae) in Madagascar. Bull. Mus. Natl. Hist. Nat., Sér. 4, Sect. B, Adansonia 11: 235–255.

———. 1991. An overview of the systematics, phylogeny and biology of the southern African Iridaceae. Contrib. Bolus Herb. 13: 1–74.

———. 1995. Iridaceae. Pp. 62–67 *in* M. Thulin (editor), Flora of Somalia, volume 4. Royal Botanic Gardens, Kew. In press.

———. In press (1996). *Gladiolus* in Tropical Africa. Timber Press, Portland, Oregon.

——— & J. C. Manning. 1995. Phylogeny of the African genera *Anomatheca* and *Freesia* (Iridaceae–Ixioideae), and a new genus *Xenoscapa*. Syst. Bot. 20: 161–178.

Lewis, G. J. 1959. The genus *Babiana*. J. S. African Bot., Suppl. 3.

———, A. A. Obermeyer & T. T. Barnard. 1972. A revision of the South African species of *Gladiolus*. J. S. African Bot., Suppl. 10: 1–316.

Thulin, M. 1994a. Cal Madow, Somalia. Pp. 194–195 *in* S. D. Davis, V. H. Heywood & A. C. Hamilton (editors), Centre of Plant Diversity, a Guide and Strategy for their Conservation, Volume 1. Information Press, Oxford, U.K.

———. 1994b. Aspects of disjunct distributions and endemism in the arid parts of the Horn of Africa, particularly Somalia. Pp. 1105–1119 *in* J. H. Seyani & A. C. Chikuni (editors), Proceedings of the XIIIth plenary Meeting AETFAT, Malawi, Volume 2. National Herbarium and Botanic Gardens of Malawi, Zomba.

———. 1995. *Trachyandra triquetra* (Asphodelaceae), a new species from the Horn of Africa. Nordic J. Bot. 16. In press.

Winter, B. de. 1974. Floristic relationships between the northern and southern arid areas of Africa. Mitt. Bot. Staatssamml. München 10: 424–437.

# Some Taxonomic Changes in *Syringa* L. (Oleaceae), Including a Revision of Series *Pubescentes*

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ABSTRACT. A number of species of *Syringa* are reviewed, and series *Pubescentes* is revised. At infraspecific rank, the following new combinations in *Syringa* from Asia are proposed: *S. komarowii* subsp. *reflexa*, *S. oblata* subsp. *dilatata*, *S. reticulata* subsp. *amurensis*, *S. reticulata* subsp. *pekinensis*, and *S. pubescens* subsp. *microphylla* var. *potaninii*. Identification keys are presented.

The preparation of an account of *Syringa* for the forthcoming English version of the *Flora of China*, combined, for the senior author, with the preparation of an account for the *European Garden Flora*, has led to a review of the genus and a reassessment of the appropriate rank for some of the previously recognized species or varieties. The following are the taxonomic and nomenclatural consequences.

## A. *SYRINGA KOMAROWII*

**Syringa komarowii** Schneider subsp. **reflexa** (Schneider) P. S. Green & M. C. Chang, stat. nov. Basionym: *Syringa reflexa* Schneider, Repert. Spec. Nov. Regni Veg. 9: 80. 1910. SYNTYPES: "C.-China. Hupeh: 8–9000′", *Henry 6819* (K); "W. Hupeh," *Wilson 2078* (K).

Although McKelvey (1928: 77) stated, "The relationship of *Syringa komarowi* to *S. reflexa* Schneider is exceedingly close, and it is possible that at some future time *S. komarowi* may be classified as an extreme form of the Hupeh [Hubei] plant," it was not until 1990 that the two were formally united at the varietal rank (Chang & Chen, 1990: 35). However, while bearing the morphological differences in mind, because *S. komarowii* and *S. reflexa* occupy distinct geographical areas, the former in southern Gansu, southern Shaanxi, Sichuan, and northern Yunnan, the latter in western Hubei and northeastern Sichuan, we believe that subspecies is the appropriate infraspecific catagory. They may be distinguished as follows:

1a. Corolla lobes somewhat erect; inflorescence usually ± compact . . . . . subsp. *komarowii*
1b. Corolla lobes spreading; inflorescence somewhat pyramidal, often interrupted . . . . . .subsp. *reflexa*

## B. *SYRINGA OBLATA*

**Syringa oblata** Lindley subsp. **dilatata** (Nakai) P. S. Green & M. C. Chang, stat. nov. Basionym: *Syringa dilatata* Nakai, Bot. Mag. (Tokyo) 32: 128. 1918. SYNTYPES: Korea. "Pon-san," *Kamibayashi s.n.*, "Pan-syu-non," *Uchiyama s.n.*, "in summo montis Nonensan," *Nakai 2209*, "Kosui," *Nakai 2602*, "Su-hun," *Nakai 2610*, and "Chokoku," *Kin-o-sho 268* (syntypes, TI not seen).

As well as exhibiting morphological distinctness, *Syringa dilatata* and *S. oblata* have different distributions, the former in Korea and northeastern China, and the latter in northern China. The rank of subspecies seems therefore to be the more appropriate one. They may be distinguished as follows:

1a. Leaves usually slightly broader than long, 2.5–7 × 3–8 *cm*, base truncate to usually slightly cordate; corolla tube 6–11 mm long, corolla lobes 4–6 mm long . . . . . .subsp. *oblata*
1b. Leaves usually slightly narrower than long, 3–7 × 2.5–6 cm, base truncate; corolla tube 11–14 mm long, corolla lobes 5–8 mm long . . . . . .subsp. *dilatata*

## C. *SYRINGA RETICULATA*

**Syringa reticulata** (Blume) Hara subsp. **amurensis** (Ruprecht) P. S. Green & M. C. Chang, stat. nov. Basionym: *Syringa amurensis* Ruprecht, Bull. Cl. Phys.-Math. Imp. Acad. Sci. St. Pétersb. 15: 371. 1857. TYPE: China/Russia. Ussuri River area, *Maack s.n.* (syntypes, ?LE not seen).

**Syringa reticulata** (Blume) Hara subsp. **pekinensis** (Ruprecht) P. S. Green & M. C. Chang, stat. nov. Basionym: *Syringa pekinensis* Ruprecht, Bull. Cl. Phys.-Math. Imp. Acad. Sci. St. Pétersb. 15: 371. 1857. TYPE: China. Hebei: ?*Kirilov s.n.* (holotype, ?LE not seen).

Once again, and for similar reasons, it is believed that subspecific rank is the appropriate one for these taxa. *Syringa reticulata* subsp. *reticulata* is native to Japan, subspecies *amurensis* to northeasternmost China, adjacent Russia, and Korea, and subspecies *pekinensis* to northern China and Mongolia. Although in most of the relevant literature, the last has been treated at specific rank, it is noteworthy that Maximowicz (1859: 194), only two years after the plant was first described as a species, reduced it to varietal rank. Furthermore, Hemsley (in Forbes & Hemsley, 1889: 82) sank *S. pekinensis* under *S. amurensis* and commented, "The differences between the Mandshurian, Japanese, and Chinese specimens are slight." They may be keyed out as follows:

1a. Leaves mostly longer than 7 cm, hairy, especially on the midrib and main veins on the under surface; capsules blunt . . . . . subsp. *reticulata*

1b. Leaves mostly less than 7 cm long, glabrous above.
  2a. Petioles stoutish, 1–2 cm long; veinlets slightly sunk; capsule apex blunt . . . . . subsp. *amurensis*
  2b. Petioles slender, 1.5–3 cm long; veinlets not sunk on the upper surface of the leaf; capsule apex acute . . . . . subsp. *pekinensis*

## D. A Revision of Series *Pubescentes*

Chang and Chen (1990; see also Chang & Qui, 1992: 63–71) have proposed changes in rank for some of the taxa in series *Pubescentes* (C. K. Schneider) Lingelsheim, which, following the classic monograph of McKelvey (1928), have previously been treated as species by botanists and gardeners alike. The taxa in this section are closely related, and, for some, classification at the rank of species does not seem justified. However, examination of numerous collections of these plants has led to certain modifications to the classification proposed by Chang and Chen. These are set out below, following an identification key to the revised series. The numerous synonyms cited by McKelvey (1928) are not repeated here.

### Key to *Syringa* Series *Pubescentes*

1a. Leaves with lateral veins ± pinnate, the 2 lowest pairs of veins not closely adjacent.
  2a. Leaves usually manifestly longer than broad, sometimes almost as broad as long; corolla lobes 2–4 mm long.
    3a. Upper (adaxial) surface of leaves glabrous or glabrescent, except sometimes for a slight pubescence on midrib and main veins on the under surface, rarely pilose.
      4a. Leaves usually 1.5–3.5(–7) cm long, 1–2.5(–4) cm broad . . . . . 1. *S. pubescens*
        5a. Young stems and inflorescence axes ± 4-angled; corolla tube 10–15 mm long; north-central China . . . . . 1a. subsp. *pubescens*
        5b. Young stems and inflorescence axes ± terete; corolla tube 8–10 mm long; northwestern and west-central China . . . . . 1d. subsp. *microphylla* var. *microphylla*
      4b. Leaves 5–11 (rarely less) cm long, 2.5–6 (rarely less) cm broad . . . . . 1b. subsp. *patula*
    3b. Upper surface of leaves finely, often scattered, pilose.
      6a. Leaves (2.5–)3–5(–7) cm long, (1.5–)2–2.5(–3.5) cm broad, densely pilose to villous below.
        7a. Young stems and inflorescence axes puberulent to densely pilose.
          8a. Corolla tube 7–8 mm long; petioles 2–12 mm long . . . . . 1c. subsp. *julianae*
          8b. Corolla tube 8–10 mm long; petioles 2–5 mm long . . 1d. subsp. *microphylla* var. *potaninii*
        7b. Young stems and inflorescence axes ± densely villous . . . . . 2. *S. mairei*
      6b. Leaves 1.5–3 cm long, 0.6–1.8 cm broad, glabrous except for a pilose midrib and primary veins below . . . . . 3. *S. pinetorum*
  2b. Leaves as broad as long, 1.2–2.2 cm broad, or slightly broader than long, almost circular; corolla lobes 4–5 mm long . . . . . 4. *S. wardii*
1b. Leaves with 2 pairs of veins ± palmately arranged at the lamina base, blade usually 1.5–3(–4) cm long, 1–2.7(–3) cm broad . . . . . 5. *S. meyeri*

**1. Syringa pubescens** Turczaninow, Bull. Soc. Nat. Moscou 13: 73. 1840. TYPE: China. Hebei: 1831, *Kirilov s.n.*? (holotype, LE, photograph, K).

Erect or spreading shrubs to 5 m tall, young stems glabrous or pubescent. Leaves narrowly to broadly ovate, elliptic or broadly elliptic, 1.5–9(–11) cm long, 1–5(–6) cm broad, glabrous to densely villous, 3 primary veins not closely adjacent at the lamina base. Inflorescence dense or open, glabrous to pilose, 3–15 cm long. Corolla tube 4–15 mm

long, lobes 2–4 mm long. Capsule slender or stoutish, 0.7–1.7 cm long, smooth or with a few lenticels.

1a. **Syringa pubescens** subsp. **pubescens**

Erect shrubs to 5 m tall, young stems glabrous. Leaves ovate to usually broadly ovate, sometimes elliptic, (1.5–)2.5–3.5(–7) cm long, (1–)1.7–2.5(–4) cm broad, apex acute to obtuse, very slightly acuminate, glabrous above, glabrous to pilose below, especially on the midrib and primary veins toward their bases. Inflorescence ± dense, 4–8(–10) cm long, axes glabrous to pilose. Corolla tube 10–15 mm long, lobes 2–4 mm long, purplish lilac, paler within. Capsule stoutish, 9–10 mm long, smooth with a few lenticels.

This subspecies is recorded (Chang in Chang & Qui, 1992) from the following provinces of China, all in the northern part of the country: Hebei, Henan, eastern Shaanxi, western Shandong, and Shanxi.

1b. **Syringa pubescens** subsp. **patula** (Palibin) M. C. Chang & X. L. Chen, Invest. Stud. Nat. 10: 34. 1990. *Ligustrum patulum* Palibin, Acta Hort. Petrop. 18: 146 (Conspec. Fl. Korea 2: 10), 1900. *Syringa patula* (Palibin) Nakai, Bot. Mag. (Tokyo) 40: 148. 1926. TYPE: Korea, *Sontag s.n.* (holotype, ?LE not seen).

*Syringa velutina* Komarov, Acta Hort. Petrop. 18: 428. 1901. TYPE: Korea, *Komarov s.n.* (syntype, ?LE not seen).

*Syringa palibiniana* Nakai, Bot. Mag. (Tokyo) 27: 32. 1913. TYPE: Korea, *Faurie s.n.* (holotype, TI not seen).

Erect shrubs to 3 m tall, young stems slightly pubescent to glabrous. Leaves ovate or broadly ovate to usually elliptic or broadly elliptic, (3–)5–9(–11) cm long, (2–)2.5–5(–6) cm broad, apex slightly acuminate, glabrous above, rarely scattered short pilose, pilose to usually glabrous below except for the midrib and primary veins toward their bases. Inflorescence ± dense, 5–9(–15) cm long, pilose. Corolla tube 7–8(–10) mm long, lobes 2(–3) mm long, vinaceous lilac, white within. Capsules slender, curved, 1–1.5 cm long, with a few lenticels.

Recorded from northeasternmost China (Jilin and Liaoning) and Korea. This is a hardy plant that has proved its worth as a garden plant under rigorous climatic conditions. In the West it is perhaps best known in cultivation in the form of cv. 'Miss Kim.'

1c. **Syringa pubescens** subsp. **julianae** (C. K. Schneider) M. C. Chang & X. L. Chen, Invest. Stud. Nat. 10: 34. 1990. *Syringa julianae* C. K. Schneider, Ill. Handb. Laubholzk. 2: 777. 1912 & Bull. Misc. Inform. Kew 1912: 37. 1912. TYPE: cultivated, seed from China, Hubei, *Wilson 1220A* (holotype, ?W not seen; isotype, K).

Spreading shrubs to 2 m tall, young stems puberulent. Leaves narrowly ovate to elliptic, (2.5–)4–5(–7) cm long, (1.5–)2.3–2.5(–3) cm broad, apex acute, slightly long-acuminate, scattered pilose above, pilose below, densely so on midrib and main veins; petioles 2–12 mm long. Inflorescence ± open, (3–)4–6(–10) cm long, densely pilose. Corolla tube 7–8 mm long, lobes 2–3 mm long, violet-purple, paler within. Capsules slender, 0.7–1 cm long, smooth.

This subspecies has been recorded only from the province of Hubei.

1d. **Syringa pubescens** subsp. **microphylla** (Diels) M. C. Chang & X. L. Chen, Invest. Stud. Nat. 10: 34. 1990. *Syringa microphylla* Diels, Bot. Jahrb. Syst. 29: 531. 1900. SYNTYPES: China. Shaanxi: *Giraldi 1644 & 1645* (B destroyed).

i. **Syringa pubescens** [subsp. **microphylla**] var. **microphylla**

Spreading shrubs to 2 m tall, young stems finely puberulent to rarely glabrous. Leaves ovate to elliptic, narrowly to broadly so, apex obtuse to acute, very slightly acuminate, glabrous above, rarely scattered pilose, glabrous below, except the midrib and primary veins toward their bases, rarely pilose. Inflorescence ± dense, 4–10(–12) cm long, pilose. Corolla tube 8–10 mm long, lobes 2–3 mm long, pinkish lilac, slightly paler within. Capsules ± slender, 1.2–1.5 cm long, smooth with a few lenticels.

Recorded (see Chang in Chang & Qui, 1992: 67) from the Chinese provinces of Gansu, Hebei, Henan, Hubei, Ningxia, Qinghai, Shaanxi, Shanxi, and Sichuan. Variety *flavoanthera* (X. L. Chen) M. C. Chang has been recognized, but the taxonomic value of anther color is uncertain, and the recording of it can be suspect, seeing that the pollen of purplish anthers can make them appear yellow after dehiscence.

ii. **Syringa pubescens** [subsp. **microphylla**] var. **potaninii** (C. K. Schneider) P. S. Green & M. C. Chang, comb. et stat. nov. Basionym: *Syringa potaninii* C. K. Schneider, Repert. Spec. Nov. Regni Veg. 9: 80. 1910. TYPE: "Nord-China, O-kansu, am Flusse Tschi lo ku im Gebirge," 1885, *Potanin s.n.* (holotype, ?LE not seen; isotype, K).

More or less erect shrubs to 4 m tall, young stems finely puberulent. Leaves ovate to elliptic, (2.5–)3–5(–6) cm long, (1.5–)2–2.5(–3.5) cm broad, apex acute, somewhat acuminate, puberulent to glabrous above, rarely scattered pilose, scattered to densely pilose below, especially on the midrib and main veins toward the base; petioles 2–5 mm long. Inflorescence ± dense, 6–10 cm long, finely puberulent. Corolla tube 8–10 mm long, lobes 2–3.5 mm long, pinkish lilac, paler within. Capsules slender, 1.5–1.7 cm long, smooth with a few lenticels.

Known only from the Chinese province of Gansu.

**2. Syringa mairei** (H. Léveillé) Rehder, J. Arnold Arbor. 15: 302. 1934. *Ligustrum mairei* H. Léveillé, Cat. Pl. Yun-Nan 181. 1916. TYPE: China. Yunnan: *Maire s.n.* (hclotype, E, photograph, K).

*Syringa rugulosa* McKelvey, J. Arnold Arbor. 6: 152. 1925. TYPE: China. Yunnan: *Maire "169/1914"* (holotype, E, photograph, K).

Shrubs to 4 m tall, young stems densely villous. Leaves ovate to elliptic, somewhat broadly so, (2–)4–4.5(–6) cm long, (1.5–)2–2.5(–3) cm broad, apex acuminate, pilose above, densely pilose below. Inflorescence dense, 7–12 cm long, villous. Corolla tube 7–9 mm long, lobes 2–3 mm long, "rose-violet." Capsule stoutish, 1 cm long, smooth with a few lenticels.

This is a little known plant from Yunnan. The two names, *Syringa mairei* and *S. rugulosa*, were almost certainly based on duplicates of the same collection made by E. E. Maire.

**3. Syringa pinetorum** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 132. 1916. TYPE: China. Yunnan: *Forrest 12472* (holotype, E, photograph, K).

Slender shrubs to 2.5 m tall, young stems pilose. Leaves narrowly ovate to elliptic, 1.5–3 cm long, 0.6–1.8 cm broad, apex acute, acuminate, scattered pilose above, glabrous below except for the midrib and primary veins toward their bases. Inflorescence ± dense, 8–12 cm long, pilose. Corolla tube 9–10 mm long, lobes 3 mm long, "pale lavender-rose." Capsule with inconspicuous lenticels.

A little known plant from Tibet and the province of Yunnan. Plants that have been cultivated under this name have been misidentified. They have frequently been found to be *S. yunnanensis* Franchet.

**4. Syringa wardii** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 132. 1916. TYPE: China. Yunnan: *Kingdon Ward 312* (holotype, E, photograph, K).

Shrubs to 5 m tall, young stems pilose. Leaves ± circular, about 1.2–2.2 cm long and broad, apex rounded, extremely shortly acuminate, glabrous above and below, 3 primary veins on each side, not adjacent at the base of the lamina. Inflorescence somewhat dense, 6–9 cm long, pubescent. Corolla tube 13–14 mm long, lobes 4–5 mm long, pale pinkish lilac? Capsule with inconspicuous lenticels.

This species is only known from the type collection and was previously treated as a synonym of *Syringa pinetorum* by Chang (in Chang & Qui, 1992: 71). However, the small, more or less circular leaves and long corolla tube mark it out as distinct.

**5. Syringa meyeri** C. K. Schneider in Sargent, Pl. Wilson. 1: 301. 1912. TYPE: cultivated at the Arnold Arboretum, origin from cultivation in China, Hebei, *Meyer*, under Dept. of Agriculture number 23032 (holotype, A).

Compact shrub to 1.5 m tall, young stems finely puberulent. Leaves ovate to very broadly ovate-elliptic, (1.5–)2–3(–4) cm long, (1–)1.8–2.7(–3) cm broad, apex obtuse, rarely somewhat acute, very slightly and shortly acuminate, glabrous above, glabrous below except the midrib and the primary veins toward their bases, 2 (or 3) primary veins on each side, subpalmate, arising within 2 mm of the base of the lamina. Inflorescence dense, 5–11 cm long, puberulent. Corolla tube 9–12 mm long, lobes 2–3 mm long, purplish lilac, paler within. Capsules slender, 1–1.2 cm long, lenticular.

This compact, relatively dwarf species was first described from cultivated material. It is widely grown in northern China, and in the West under the name 'Palibin' (see Green, 1979). It was known only as a cultivated plant until discovered in the wild by Chang as recently as 1989 in the province of Liaoning. This plant has been described as:

*Syringa meyeri* var. *spontanea* M. C. Chang, Invest. Stud. Nat. 10: 33. 1990. TYPE: China. Liaoning: *M. C. Chang & X. K. Qin 2872* (holotype, SHM; isotype, K).

The variety is distinguished by its looser inflorescence, somewhat shorter corolla tube, and smaller leaf.

Literature Cited

Chang, M. C. & X. L. Chen. 1990. Studies on Chinese *Syringa* (1). Invest. Stud. Nat. 10: 32–40. [Chinese with English summary.]

——— & L. Q. Qui (Editors). 1992. Oleaceae. Fl. Reipubl. Popularis Sin. 61: 2–222.

Forbes, F. B. & W. B. Hemsley. 1889. Index florae sinensis 2. J. Linn. Soc., Bot. 26: 1–561.

Green, P. S. 1979. *Syringa meyeri* Palibin. Bot. Mag. 182: t. NS. 778.

McKelvey, S. D. 1928. The Lilac, a Monograph. London.

Maximowicz, C. J. 1859. Primitiae florae amurensis. Mém. Acad. Imp. Sci. St. Pétersburg Divers Savants 9.

# *Homalia pennatula* (Musci: Neckeraceae), a New Combination from Southeast Asia, with a Key to the Species of *Homalia*

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ABSTRACT. *Symphyodon pennatulus* (Dixon) Dixon from Southeast Asia is transferred to the genus *Homalia* of the Neckeraceae (Musci). A key to the five species and one variety of *Homalia* is provided.

*Homalia* (Bridel) Schimper is primarily distributed in the northern temperate regions and nearby subtropical borders, where it grows on boulders, rock outcrops, or bases of trees. It is characterized by strongly complanate plants with leaves arranged in distinct ranks; by oblong-ovate to spatulate leaves with broad apices and smooth leaf cells; and by smooth capsules with a "hypnoid" peristome. *Symphyodon* Montagne has 14 species worldwide and is primarily distributed in the tropical and subtropical regions of Southeast Asia, with one species in Hawaii, South Africa, and Central and South America, respectively. In Southeast Asia, it grows exclusively on tree trunks and tree branches. Besides its habitat distinction, taxonomic characters of generic importance for *Symphyodon* are found in the capsule ornamentation and peristomes. It has echinate capsules and an "isobryoid" peristome. Other secondary gametophyte features include: leaves often appressed and imbricate or spreading; leaf apices narrowed; and leaf cells prorate.

*Symphyodon pennatulus* (Dixon) Dixon was excluded from the genus *Symphyodon*, because it is epilithic and has strongly complanate to sub-distichous leaves (He & Snider, 1992). The type specimen of *Symphyodon pennatulus* is meager and contains no sporophytes. Since no other specimens of this species were available, He & Snider (1992) were uncertain of its generic placement. Recently, numerous collections of this moss have come from Thailand, and though they consistently lack sporophytes, we now have enough material to make detailed observations on the gametophytes. *Symphyodon pennatulus* exhibits many aspects of *Homalia*, such as a strongly complanate habit, a homalioid-type leaf insertion showing an eight-ranked phyllotaxy (see He, 1992), oblong-ovate to spatulate leaves with broad and rounded apices, and a variable costal morphology. It is similar to the widely distributed *Homalia trichomanoides* (Bridel) Schimper in overall similarities of leaf shape and the absence of pseudoparaphyllia, but it differs in having distinct double costae and linear, projecting median leaf cells. On the basis of the double leaf costae and elongate median leaf cells, *Symphyodon pennatulus* appears most closely related to *Homalia glabella* (Hedwig) Schimper from Central and South America, except that it lacks pseudoparaphyllia. Although the narrowly linear and projecting median leaf cells of *Symphyodon pennatulus* and its presence in southern Asia differ from those of previously recognized *Homalia* species, the overall gametophyte features of this moss support its placement in *Homalia*. Hence, we are making the following new combination. A key to the five species and one variety of *Homalia* now recognized is provided. A description and an illustration of the species treated here will be published in the forthcoming revision of *Homalia* by the first author.

**Homalia pennatula** (Dixon) He & Enroth, comb. nov. Basionym: *Stereodon pennatulus* Mitten ex Dixon, Rec. Bot. Surv. India 6: 66. 1914. *Symphyodon pennatulus* (Dixon) Dixon in Brotherus, Nat. Pflanzenfam., ed. 2, 11: 267. 1925. TYPE: Myanmar (Burma). Moulmein, *Parish s.n.* (holotype, NY; isotype, BM).

In his book entitled *Burma, Its People and Productions*, Mason (1883) published a list of plants, including mosses. *Homalia erosa* Hampe and *Homalia pennatula* Mitten were listed in this publication. Both names are apparently nomina nuda, since no descriptions or basionyms were given. The former is clearly a herbarium name, because we have seen several herbarium specimens annotated with the name *Homalia erosa* Hampe. However, we have seen no specimens bearing the name *Homalia pennatula* Mitten, nor has it ever been published

validly. Although it could be based on Mitten's herbarium name *Stereodon pennatulus, Homalia pennatula* Mitten has no nomenclatural bearing in our paper.

In recognizing that *Homalia trichomanoides* var. *japonica* (Besch.) He, stat. nov., cited in He (1992) has not been validly published, we make the following new combination:

**Homalia trichomanoides** var. **japonica** (Bescherelle) He, comb. nov. Basionym: *Homalia japonica* Bescherelle, J. Bot. (Morot) 13: 39. 1899. TYPE: Japan. Sengantoge, *Faurie 14984* (holotype, PC; isotype, KYO).

*Additional selected specimens examined.* MYANMAR. Moulmein, *Kurz 2930* (BM). INDIA. Kerala, *Norkett 13377* (BM). THAILAND. **Changburi:** *Larsen et al. 1857* (AAU, MO). **Chiangmai:** Mt. Suthep, 98°55′E, 18°50′N, *Touw 8395* (BM, L, MO, NY). **Krabi:** Khao Phanom Bencha Park, *Schäfer-Verwimp & Verwimp 16230* (H, MO). **Nakhon Nayok:** *Larsen et al. 3380* (AAU, MO). **Nakhon Sawan:** 98°55′E, 16°40′N, *Touw 8319* (BM, L, MO, NY). **Prachinburi:** 101°30′E, 14°30′N, *Touw 12215* (BM, L, MO). **Trat:** 102°49′E, 11°59′N, *Charoenphol et al. 4982* (AAU, BM, H, MO, NY); Ko Kut, 101°31′E, 12°35′N, *Charoenphol et al. 5129* (AAU, BM, H, MO, NY).

Key to the Species and Varieties of *Homalia*

1. Costa single, extending ½–⅘ the leaf length . . . 2
1. Costa double or forked, less than ⅓ the leaf length or indistinct . . . . . 4
2(1). Pseudoparaphyllia present; costa stout, extending ¾–⅘ the leaf length; leaf apices dentate, with large teeth; western Europe, northern Africa, Canary Islands . . . 1. *H. lusitanica* Schimper
2. Pseudoparaphyllia absent; costa slender, extending ½–¾ the leaf length; leaf apices moderately serrate, with small teeth . . . . . 3
3(2). Autoicous; secondary stems often blunt near the apex; flagelliform branches uncommon; eastern Asia, Russia, Europe, North America, Mexico . . . . . .2a. *H. trichomanoides* var. *trichomanoides* (Hedwig) Schimper
3. Dioicous; secondary stems often attenuate near the apex; flagelliform branches commonly present; Japan, Korea, Taiwan . . . . . .2b. *H. trichomanoides* var. *japonica* (Bescherelle) He
4(1). Median leaf cells rhombic, 8.5–17.5 μm long; Azores, Maderia, Canary Islands, Caucasus . . . . . .3. *H. webbiana* (Montagne) Schimper
4. Median leaf cells oblong-rhomboidal to narrowly linear, 35–100 μm long . . . . . 5
5(4). Leaves 1.25–3.25 mm × 0.75–1.25 mm; pseudoparaphyllia present; Mexico, West Indies, Central America, Brazil, Venezuela . . . . . .4. *H. glabella* (Hedwig) Schimper
5. Leaves 0.8–1.2 mm × 0.5–0.65 mm; pseudoparaphyllia absent; India, Myanmar, Thailand . . . . . 5. *H. pennatula* (Dixon) He & Enroth

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Literature Cited

He, Si. 1992. A worldwide taxonomic revision of the genera *Homalia, Pendulothecium* (Musci: Neckeraceae) and *Symphyodon* (Musci: Symphyodontaceae). Doctoral Dissertation, University Microfilms, Ann Arbor.

——— & J. A. Snider. 1992. A preliminary survey of the moss genus *Symphyodon* (Symphyodontaceae, Musci). Bryobrothera 1: 283–287.

Mason, F. 1883. Burma, Its People and Productions. Vol. II (Botany). Stephen Austin & Sons, Hertford.

# *Polygonum hickmanii* (Polygonaceae), a New Species from California

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ABSTRACT. A new endemic species of *Polygonum* is described from Scotts Valley, California. Differentiation from closely related taxa *P. parryi* and *P. heterosepalum* is presented.

**Polygonum** (sect. *Duravia*) **hickmanii** H. R. Hinds & R. Morgan, sp. nov. TYPE: U.S.A. California: Santa Cruz County, Scotts Valley, grassland N of Navarra Drive, W of Carbonero Creek, 1 July 1993, *R. Morgan 2119* (holotype, CAS; isotypes, MO, RSA, UC, UNB). Hickman's knotweed.

Herba annua. Folia sessilia, 0.5–3.5 cm × 1–1.5 mm, revoluta. Ocrea divisa ad basem in longas rectas fibras. Flores singuli in axillis omnium paene bracteorum foliorum. Achenia laevia, (2–)2.3 × 1.6 mm, duobus lateribus concavis et uno latere latiore planioreque.

Erect taprooted annual, 2–5 cm, simple in depauperate plants to profusely branched from near the base. Leaves sessile, linear, acuminate, mucronate, 0.5–3.5 cm × 1–1.5 mm, revolute and wing-nerved below, closely investing and with the ocreae ± concealing the stems. Ocrea 6 mm long, silvery, divided nearly to base into long straight filaments, adnate to the base of the leaves and appearing almost as long as the apical leaves. Flowers single in axils of almost all bracteal leaves, tepals white, with two outer tepals cucullate and mucronate, 3 mm long, three inner tepals rounded to obtuse 2 mm long, anthers conspicuous, orange-pink 0.4 mm. Achenes smooth, (2–)2.3 × 1.6 mm, light to dark olive brown, lighter on the angles, with two concave sides and one broader ± flat side; not exserted. Styles 0.3 mm, persistent. Flowering from late May to August (October).

*Polygonum hickmanii* is known from two sites about one mile apart, at the northern end of Scotts Valley, Santa Cruz County, California, at about 700–800 feet elevation and occurs only in very restricted microhabitats within an isolated relictual grassland. The sites are gently sloping to nearly level, with fine-textured shallow soil over outcrops of Santa Cruz mudstone and Purisima sandstone, sparsely vegetated with small annual herbs. This habitat is shared with a more abundant but equally narrow endemic, *Chorizanthe robusta* C. Parry var. *hartwegii* (Bentham) J. Reveal & R. Morgan. The population of *Polygonum hickmanii* fluctuated from about 200 to 400 plants in 1990–1992 to 1000 or more in 1993 following a relatively wet winter.

*Polygonum hickmanii* is sympatric with no other members of the section *Duravia*. The nearest location of a closely related species, *P. parryi* Greene (itself disjunct), is at Mt. Hamilton about 50 miles inland.

*Polygonum hickmanii* differs from *P. parryi* in its larger white flowers, longer leaves, larger anthers and achenes, and longer, straight ocreae. It differs from *P. heterosepalum* M. E. Peck & Ownbey in achene shape (more rounded at base as opposed to more tapering), size (1.5–2 mm), and flower structure (perianth segments very unequal).

*Polygonum hickmanii* is named for James C. Hickman (1941–1993), distinguished botanist, who confirmed the uniqueness of this taxon and whose advice and inspiration is here acknowledged.

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# Una Nueva Especie de *Marsdenia* (Asclepiadaceae) de México

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RESUMEN. *Marsdenia rzedowskiana* es descrita como nueva. Esta especie ha sido confundida con *M. macrophylla* (Humboldt & Bonpland ex Schultes) E. Fournier pero está más relacionada con *M. pringlei* S. Watson. La distribución de *M. rzedowskiana* está restringida al noreste de Puebla y partes adyacentes de Veracruz, hacia el sur de la distribución conocida de *M. pringlei* y en altitudes superiores a las de *M. macrophylla*.

ABSTRACT. *Marsdenia rzedowskiana* is described. This new species has been confused with *M. macrophylla*, but is most closely related to *M. pringlei*. *Marsdenia rzedowskiana* seems to be restricted to northeastern Puebla and adjacent Veracruz, to the south of the known distribution of *M. pringlei* and at higher elevations than *M. macrophylla*.

El género *Marsdenia* R. Brown se encuentra bien representado en México por 24–26 especies que se distribuyen en todo el país. Durante la revisión para el tratamiento del género para México y Centroamérica, se encontró material que inicialmente se incluyó en la sección *Ruehssia*, subsección *Macrophyllae* (Rothe, 1915); sin embargo, pertenecía más bien a la sección *Rostrata*, subsección *Edules*, y además correspondía a una especie no descrita.

**Marsdenia rzedowskiana** Juárez-Jaimes & W. D. Stevens, sp. nov. TIPO: México. Puebla: Municipio Teziutlán, Agua de Obispo, 30 mar. 1973 (fl), *F. Ventura 8102* (holótipo, MEXU; isótipos, ENCB, MO). Figura 1.

*Marsdeniae pringlei* S. Watson similis sed floribus minoribus, apice styli perbreviore et integro recedit.

Plantas trepadoras, con látex blanco. Tallos glabros, gruesos, 5–7 mm de ancho. Pecíolos 1–3 cm, glabrescentes; láminas 5.0–15.5 × 2.6–10.5 cm, elípticas, con 7–8 nervios secundarios, base redondeada a obtusa, ápice acuminado a cortamente acuminado, coriáceas, glabras. Inflorescencias 3–6 × 2–4 cm, con 10–22 flores, extra-axilares, laxamente ramificadas; brácteas elípticas y acuminadas, 2 mm de largo, pubescentes; pedúnculos 1.0–2.5 cm de largo, ligeramente pubescentes; pedicelos 2–4 mm de largo, pubescentes. Lóbulos del cáliz 2.6–3.0 × 2.2–2.8 mm, orbiculares, ápice algo agudo, ligeramente pubescentes por fuera, glabros por dentro, márgenes ciliados, los senos con 1–3 glándulas por dentro; corola campanulada, 5.0–6.5 × 4.8–6.6 mm, glabra por fuera, lóbulos 3.0–3.2 × 1.8–2.3 mm, oblongos, erectos en la antesis, la superficie interna pilosa en el centro, ápices ligeramente emarginados, tubo 2.5–3.0 mm de largo, piloso en la garganta, los pelos largos y blancos; lóbulos de la corona 1.5–1.7 × 1.0–1.5 mm, carnosos, redondamente deltoides, con los márgenes laterales salientes, la punta libre y terminando al mismo nivel de la parte apical de las anteras, ginostegio 2–3 mm de largo, membranas de las anteras 0.9–1.2 mm, ampliamente ovadas, anteras 0.4–0.5 mm de largo, elipsoides; corpúsculos 0.3–0.4 mm de largo, elípticos, polinios 0.3–0.4 mm de largo, casi globosos, apice del estilo 2.0–2.5 mm de largo, cónico-alargado, con una pequeña línea de bifurcación en la parte apical; carpelos glabros. Folículos desconocidos.

*Marsdenia rzedowskiana* está muy relacionada con *M. pringlei* S. Watson, puesto que ambas tienen hojas ampliamente elípticas, cimas ramificadas, flores amarillas, garganta de la corola con pelos blancos, lóbulos de la corona deltoides, ápice del estilo alargado y polinios casi globosos. Sin embargo, *M. rzedowskiana* se diferencia por poseer flores más pequeñas, lóbulos de la corola más o menos del mismo tamaño que el tubo, tubo de la corola no urceolado, ápice del estilo 3 veces más corto y presentando apenas una línea de bifurcación en la parte apical. Por otra parte, *M. rzedowskiana* sólo es conocida de la Sierra Norte de Puebla y la región adyacente a Jalapa, Veracruz, en lo que Rzedowski (1978) considera bosques mesófilos de montaña, mientras que *M. pringlei* se distribuye en un área más extensa de la Sierra Madre Oriental.

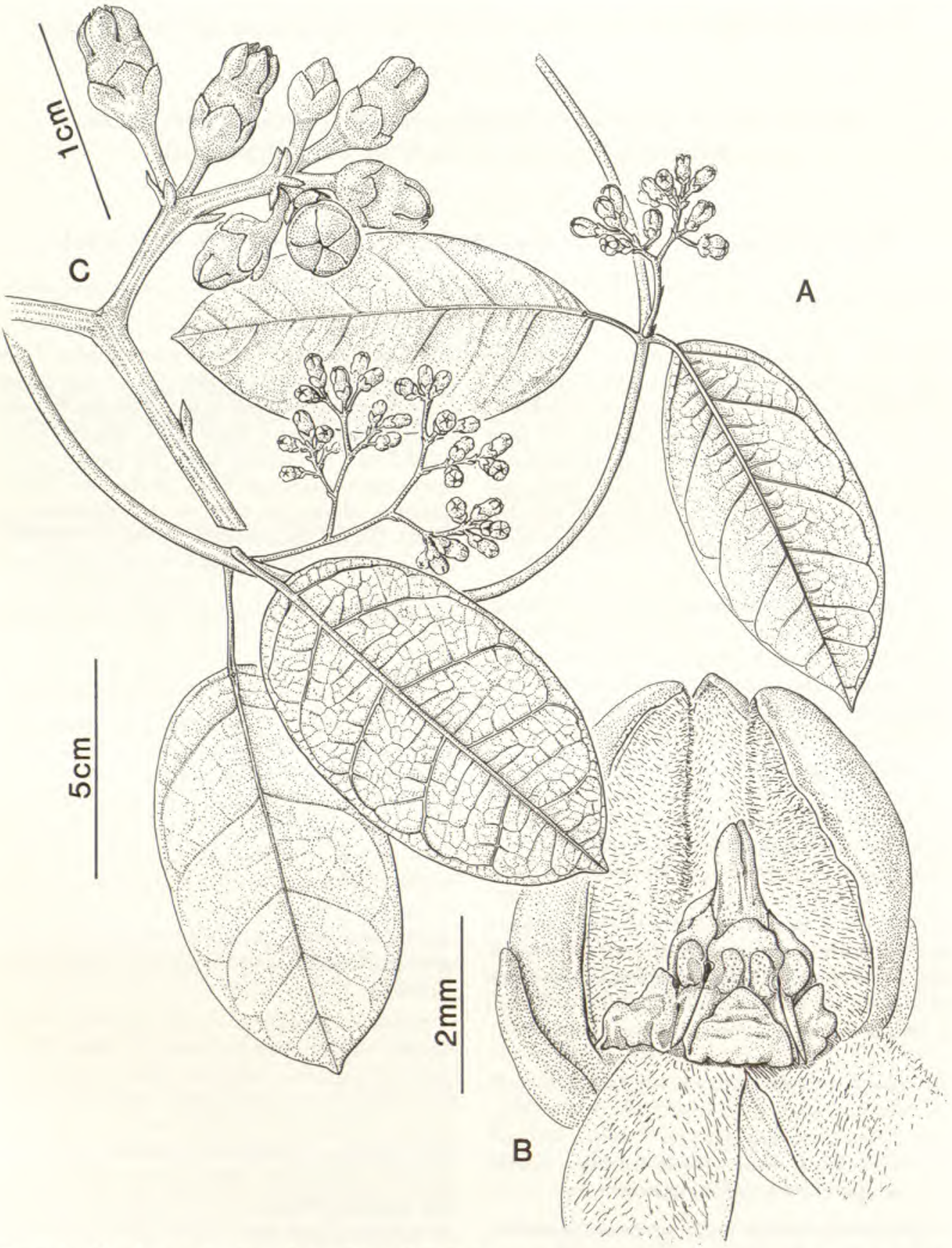


Figura 1. *Marsdenia rzedowskiana* Juárez-Jaimes & W. D. Stevens. —A. Rama fértil. —B. Flor, parcialmente disecado. —C. Inflorescencia. Basado en *M. Nee, K. Taylor & H. Narave F. 26425* (MO).

El material de *Marsdenia rzedowskiana* tradicionalmente ha sido determinado como *M. macrophylla* principalmente por su aspecto general, pero la presencia en *M. rzedowskiana* de una inflorescencia muy ramificada de flores amarillas, lóbulos de la corona deltoides y ápice del estilo cónico-alargado la separa definitivamente de ésta; además, *M. rzedowskiana* crece en bosques superiores a los

1300 m, mientras que *M. macrophylla* es de tierras bajas en México.

*Marsdenia rzedowskiana* Juárez-Jaimes & W. D. Stevens se dedica a Jerzy Rzedowski por sus importantes aportes al estudio de la vegetación y la botánica de México, trabajos por los cuales los autores tienen una gran admiración.

*Parátipos.* MÉXICO. **Veracruz:** Mpio. Acatlán, El Cerro, 3 jun. 1977 (fl), *F. Ventura 14030* (XAL); Mpio. Yecuatla, along winding road from Naolinco to Misantla, just above Santa Rita and 3 km by road from Paz de Enríquez, 1550 m (fr), *M. Nee et al. 26425* (MO). **Puebla:** Mpio. Hueytamalco, El Popual, 1500 m, *F. Ventura 1038* (US).

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Literatura Citada

Rothe, W. 1915. Über die Gattung *Marsdenia* R. Br. und die Stammpflanze der Condurangorinde. Bot. Jahrb. Syst. 52: 354–434.

Rzedowski, J. 1978. Vegetación de México. Limusa, México.

# New Taxa of *Corispermum* L. (Chenopodiaceae), with Preliminary Comments on the Taxonomy of the Genus in North America

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ABSTRACT. Five new species and three varieties of *Corispermum* L. (Chenopodiaceae) are described from North America. *Corispermum pacificum* Mosyakin and *C. pallidum* Mosyakin are restricted to the Pacific Northwest; *C. welshii* Mosyakin is known from Utah and adjacent parts of Wyoming; *C. navicula* Mosyakin occurs in Colorado and probably adjacent states; *C. hookeri* Mosyakin is known from Canada. *Corispermum pacificum* is closely related to the Asian taxa *C. crassifolium* Turczaninov and *C. maynense* Ignatov; *C. pallidum* is possibly related to *C. macrocarpum* Bunge ex Maximowicz; the three remaining new taxa and all other native North American taxa are allied to the *C. pallasii* Steven aggregate. The nomenclature of *C. pallasii* [= *C. leptopterum* (Ascherson) Iljin = *C. sibiricum* Iljin subsp. *baicalense* Iljin = *C. bjelorussicum* Klokov & Krasnova], *C. villosum* Rydberg, and *C. americanum* (Nuttall) Nuttall is discussed. Three new varieties are described: *C. americanum* var. *rydbergii* Mosyakin, *C. hookeri* var. *pseudodeclinatum* Mosyakin, and *C. ochotense* var. *alaskanum* Mosyakin. *Corispermum ochotense* Ignatov, a species recently described from the northeastern part of the Russian Far East, is reported from Alaska and northwestern Canada, where it is represented by two varieties. *Corispermum ochotense* var. *alaskanum* differs from the typical variety in having larger fruits. Preliminary results of a study of the genus in North America are discussed.

*Corispermum* has the reputation of being a problem for taxonomists and may be regarded as one of the most taxonomically complicated groups within Chenopodiaceae. As an example, the name *Corispermum hyssopifolium* L., which refers to a species restricted mostly to a small area in southeastern Europe and adjacent parts of western Asia, has been misapplied to almost all other species of the genus. For a long time the representatives of this genus were believed to have been introduced to North America from Eurasia. In the treatment by Maihle and Blackwell (1978) only three species were reported for North America: *C. hyssopifolium* L., *C. nitidum* Kitaibel ex Schultes, and *C. orientale* Lamarck (all Eurasian). However, it is now clear from the fossil evidence that *Corispermum* was present in North America at least 38,000 years before the present (for details see Betancourt et al., 1984). Native American species of *Corispermum* are evidently closely related to eastern Asian (especially Siberian) ones (see discussion below).

I strongly believe that even less than 10,000 years was sufficient for Asian ancestors of North American taxa to evolve into several distinct races (species or subspecies) because the high rate of microevolutionary processes is crucial for a successful life strategy of such annual psammophytes of pioneer and marginal habitats. The important microevolutionary patterns within the genus include both allogamy (performed by wind pollination) and autogamy (especially under unfavorable environmental conditions), high degree of morphological variability (including so-called "cryptic variability"), and high possibility of hybridization (especially between closely related species), which is typical for many other chenopods, including *Chenopodium* L. However, polyploids, which are fairly common in *Chenopodium* and many other genera of the family, seem to be absent, or at least extremely rare, in *Corispermum*: all taxa studied until present were diploids with $2n = 18$ (for additional discussion, see Adamkiewicz, 1970; Strazdin'sh, 1985; Mosyakin, 1988a).

In the course of preparation of a taxonomic treatment of *Corispermum* for the *Flora of North America*, it has become evident that several new species and varieties should be described. Before describing these taxa I will briefly discuss the taxonomy of other *Corispermum* species from North America. However, I should mention that the taxonomic treatment of the genus in North America is not yet complete, and more efforts, especially study of variability in the natural habitats, are needed. At present my experience in North American *Corispermum* is based exclusively on herbarium studies, plus some experience with Eurasian species, which was especially crucial for this work, and four weeks of fieldwork in the southwestern United States (Utah and Nevada). Because of this, some of the following

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considerations (especially concerning the *C. pallasii* Steven–*C. americanum* (Nuttall) Nuttall aggregate) should be regarded as preliminary, a kind of brief introduction to the taxonomic problems in North American *Corispermum*. A history of taxonomic study of the genus in North America, as well as literature citations, may be found in Maihle and Blackwell (1978); thus, some of the dates and references are not mentioned below in order to avoid repetition.

## Discussion

The first taxon described from North America was *C. hyssopifolium* L. var. *americanum* Nuttall [= *C. americanum* (Nuttall) Nuttall]. Unfortunately, its authentic description is insufficient, and the lectotype specimen (*Nuttall s.n.*, PH; labeled "*C. hyssopifolium* var. *pubescens*") is immature. In my opinion, this specimen cannot be assigned with certainty to any native or introduced species. Because of this, in the early stage of my work on North American *Corispermum* I regarded the name *C. americanum* as a nomen dubium. Fortunately, there is another authentic specimen, which evidently was annotated by Nuttall. This specimen is deposited in the Besser memorial collection at KW. It is labeled "*Corispermum hyssopifolium* * *americanum* m. Nuttall"; as in other similar cases, an asterisk indicates the taxon described by Nuttall himself. The herbarium sheet contains an immature plant, which is almost identical to the PH specimen, and a branch from another plant, which is more mature. *Corispermum americanum* was cultivated by Nuttall (see Nuttall, 1818), and probably the more mature specimen represents a fragment collected from a cultivated plant. Because of this find the long-neglected name *C. americanum* can be restored.

Judging from the description of *Corispermum pilosum* Rafinesque (1836) (since no authentic herbarium material has yet been traced), this taxon does not belong to *Corispermum* at all. It was described from Florida, where no species of *Corispermum* are (or have been) known. The name *C. pilosum* probably refers to the hispid form of *Salsola kali* L. aggregate (immature specimens of *Corispermum* and *Salsola* L. are often confused in herbaria). Moreover, the name is a later homonym of *C. pilosum* Pallas.

In my opinion, *Corispermum villosum* Rydberg (1897) should be regarded as a distinct native species, which is closely related to the North American *C. americanum* and Asian–North American *C. pallasii* Steven (see below), and possibly also to *C. chinganicum* Iljin (more distantly). Intermediate forms between *C. americanum* and *C. villosum* occasionally occur in regions where these species are sympatric. The characteristic features of *C. villosum* s. str. are small (usually 1.8–3.0 × 1.5–2.0 mm) fruits, almost wingless, or with a narrow wing up to 0.1(–0.15) mm broad; both wingless and narrow-winged forms are sympatric, but wingless plants seem to be much more common in the Rockies. In the taxonomy of *Corispermum*, as well as of many other Chenopodiaceae, the most reliable characters are those of the fruits. The degree of pubescence is an unstable character in most representatives of the genus: it largely depends on the age of the plant (plants often become glabrous at maturity). Because of this I can find no sound justification for maintaining *C. villosum* and *C. emarginatum* Rydberg (1904) as separate species. The lectotype of the first species (Montana: Manhattan, 1895, *Rydberg 2623*, US; isolectotype at NY) is younger and, consequently, more pubescent; the type of *C. emarginatum* (Wyoming: Laramie, 15 Sep. 1897, *Aven Nelson 4282*, RM; isotypes at GH, MO, NY) is completely mature and almost glabrous. However, the fruit characters are essentially the same in both species, and, in my opinion, these taxa should be united under the name *C. villosum*, which has priority.

*Corispermum imbricatum* A. Nelson (1909) and *C. simplicissimum* Lunell (1910), despite their differences in habit, both have small narrow-winged fruits of similar shape and dimensions. The type of *C. imbricatum* (Wyoming: Laramie Hills, 29 Aug. 1902, *Elias Nelson 733*, RM) represents a morphotype, with stems branched from the base, and inflorescences distinctly clavate and dense at the apex. This morphotype is somewhat transitional toward *C. villosum*. The authentic specimens of *C. simplicissimum* (type: North Dakota: Pierce Co., Barton, on a lake shore, 26 Aug. 1890, *Lunell 395*, MIN) are branched above the base, and their inflorescences are more lax and narrow; judging from available herbarium specimens, this morphotype seems to be common in the Great Plains region. It differs from typical *C. americanum* only in branching habit. In both *C. imbricatum* and *C. simplicissimum*, branches of inflorescences are simple or nearly so. These taxa probably represent extremes of the variability of *C. americanum* s.l.

*Corispermum americanum* has the largest area of distribution among the native species of *Corispermum*, centered mostly in the Rocky Mountains and adjacent portions of the Great Plains, and it is very variable, especially in its vegetative characters. Plants occurring in the Great Plains region usually have winged fruits and often show some degree of

morphological transition toward *C. pallasii* (see below).

Specimens related to the *Corispermum pallasii–C. americanum* aggregate with unusually large (up to 4.5–5.0 mm long) wingless or narrow-winged fruits are known from the southwestern United States (mostly Texas, Oklahoma, Colorado, New Mexico), and from western central Canada (mostly Alberta and Saskatchewan). The Canadian plants are evidently more closely related to *C. pallasii* s. str. and *C. ochotense* Ignatov var. *alaskanum* Mosyakin described below, but they are very different in habit: inflorescences are usually short-clavate, dense and thick, with strongly imbricate broad bracts. The large-fruited Canadian plants are probably identical to "*C. hyssopifolium*" var. *robustius* Hooker (see Hooker, 1840). However, I have not seen the type of Hooker's variety. Because of this I am not convinced that it is the same as the large-fruited Canadian plants, and prefer to describe the latter as *C. hookeri* Mosyakin (see below).

The large-fruited plants from the southwestern United States are more closely related to *Corispermum americanum* s. str. They differ from northern large-fruited specimens in having fruits more elongate and obovate (more distinctly broadest above the middle than in the Canadian specimens), often with white warts (formed by loose portions of pericarp) and reddish brown spots (a character that occurs in several species, including *C. pallasii*), usually with a more prominent triangular "beak" (formed by the style bases in mature fruits) at the apex. Some of these forms remain enigmatic, and more information is needed to determine their taxonomic status. The most striking and recognizable morphotype is described below as *C. navicula* Mosyakin.

Another complicated case is *Corispermum marginale* Rydberg. In the protologue Rydberg (1903) cited one collection from New Mexico and three localities from Colorado. His description matches the characters of some plants occurring in the southwestern United States and northern Mexico. These plants differ from *C. americanum* s. str. and *C. villosum* s. str. in having fruits larger, up to 4.0(–4.5) mm long, and more prominently winged (wing usually ca. 0.2–0.4 mm broad), and usually a more interrupted inflorescence. Thus, Rydberg's concept of *C. marginale* as a species distinct from *C. villosum* was correct, and it is unfortunate that he cited as the holotype the New Mexican specimen (Albuquerque, 1884, *C. L. Herrick s.n.*, NY) with small narrow-winged fruits. This specimen differs from *C. americanum* s. str. only in having slightly more lax spikes, which is not sufficient for regarding it as specifically distinct. As is evident from his comments, Rydberg (1897) believed that *C. hyssopifolium* s. str. was a species with large fruits (up to 5 mm long); this erroneous concept probably affected his decision, since he apparently tried to stress the difference between his *C. marginale* and *C. hyssopifolium* (sensu Rydberg). The name must stand or fall together with the type, and because of this the epithet "marginale" should be regarded as a synonym of *C. americanum* s. str. However, I believe that other specimens cited by Rydberg (paratypes) represent a distinctive variety (or possibly subspecies), and it is validated below as *C. americanum* var. *rydbergii* Mosyakin. This variety, as well as some other forms of *C. americanum*, usually has lax spikes, and due to this was constantly misidentified by North American authors as *C. nitidum*.

For a better understanding of these taxa, it is necessary to comment briefly on *Corispermum nitidum* Kitaibel ex Schultes (or "so-called *C. nitidum*"). I have seen several herbarium specimens of the true *C. nitidum* collected in North America recently. Judging from the fruit morphology, almost all American representatives of the "*C. nitidum*" morphotype belong to the *C. pallasii–C. americanum* aggregate. Because of this I strongly believe that most of the records of this species from North America are referable to *C. americanum*. The first collections of the "*C. nitidum*" morphotype were made as early as 1847 in New Mexico (*A. Fendler 702*, GH, MO); 1852 in Chihuahua, Mexico (*G. Thurber 811*, GH); 1873 (*T. S. Brandegee 841*, MO); 1878 (*Marcus A. Jones 655*, MO); 1881–1882 in Colorado ("Common along Pueblo," *R. W. Woodward s.n.*, GH); 1879 in Texas (*E. Palmer 1165*, GH); these are only examples based on GH and MO collections. This list may be greatly extended by inclusion of references to specimens from other herbaria. In the earliest collections most of the mentioned localities were on the edge of civilization, and I cannot believe that European *C. nitidum* had already been widespread in the relative "wilderness" of the North American West. In the middle of the nineteenth century this species was poorly known even in Europe. Its natural area of distribution originally covered only the Pannonian (southeastern Central Europe, mostly along the Danube River and some of its tributaries in Hungary, Austria, Romania, and Bulgaria) and Pontic (southern Ukraine and southwestern Russia) floristic regions, with a small extension into the Turanian area (northwestern Kazakhstan). Besides, *C. nitidum* does not seem to be a markedly invasive species. It is definitely introduced in some locali-

ties in Europe (e.g., in Poland, Byelorussia, central Russia, etc.), but it cannot be regarded as widespread in the Old World. At present I know only two cases of successful and comparatively wide territorial expansion of *Corispermum* species: *C. pallasii* (= *C. leptopterum*) in central and western Europe, and *C. declinatum* Stephan ex Iljin in eastern Europe and southwestern Siberia.

Amazing morphologic parallelism is common in *Corispermum*. For example, typical specimens of *C. heptapotamicum* Iljin (central Asia) may be distinguished from *C. nitidum* by their broader, usually linear-oblanceolate lower leaves, and fruits somewhat similar to those of *C. lehmannianum* Bunge; but in many cases herbarium specimens are almost indistinguishable. Such species as *C. filifolium* C. A. Meyer ex A. Becker, *C. aralocaspicum* Iljin, and *C. declinatum* also can be confused with *C. nitidum*. Fortunately, in all these cases the fruit characters help to distinguish the taxa. Another example of this striking parallelism between some New World and Old World taxa of Chenopodiaceae is *Chenopodium novopokrovskyanum* (Aellen) Uotila (see Uotila, 1993), a species of the *C. strictum* Roth aggregate restricted to arid regions of southeastern Europe and the Irano-Turanian portion of Asia, which is similar in habit (but not closely related) to native North American taxa of the *C. leptophyllum* Nuttall ex S. Watson aggregate.

The species that seems to be common in the Great Lakes region is conspecific with *Corispermum leptopterum* (Ascherson) Iljin, a taxon described from central Europe. However, in Europe this species is evidently introduced; the possible means of its introduction will be discussed in the forthcoming review of the European species of the genus. Voss (1985) was the first to suggest that the Great Lakes plants may be conspecific with *C. leptopterum*.

Forms identical with *Corispermum leptopterum* are known from Siberia (especially southern and eastern parts, plus adjacent portions of Mongolia and China), where they are commonly referred to as *C. sibiricum* subsp. *baicalense* Iljin (see Strazdin'sh, 1985). At present I cannot find evident differences between most of the Siberian, European, and North American plants of this aggregate, except for usually narrower leaves, more lax and narrow spikes, and slightly smaller fruits in average North American specimens. I believe that this species may also be native in North America, at least in part.

Deciding which name has priority for Siberian "*Corispermum leptopterum*," one must consider at least two older names: *C. patens* Fisher ex Roemer & Schultes and *C. pallasii* Steven (both described from Siberia; see Steven, 1817). I have not yet traced any mature and unquestionably authentic specimens of the first species, and it still remains a nomen dubium. The type of *C. pallasii* (Dahuria, *Helm s.n.*, H) belongs to the group that includes plants previously referred to mostly as *C. sibiricum* s.l. The holotype specimen is not completely mature, and because of this I previously hesitated to assign it to a particular race of this group. Moreover, some presumably authentic specimens of *C. pallasii* in Besser and Turczaninov memorial collections at KW belong to *C. redowskii* Fischer ex Steven, a distinctive Siberian species with pubescent undulate-winged fruits. However, Steven knew *C. redowskii* well (see Steven, 1817), and it is improbable that he could confuse it with another species. He mentioned only one collection of his *C. pallasii* ("Semina in specimine juniore a D. Helm mihi dato, videntur emarginata"), which should be consequently regarded as the holotype. Study of several young fruits of the type of *C. pallasii*, and their comparison with immature fruits of European *C. leptopterum* and Siberian *C. sibiricum* subsp. *baicalense*, revealed no evident difference between them. Thus, the earliest available name for this species is *C. pallasii*.

*Corispermum pallasii* may be distinguished from other species occurring in the United States and Canada by its comparatively large (usually 3.0–4.5 × 2.0–3.5 mm), obovate or obovate-elliptic fruits (normally distinctly broadest above the middle); thick wing (translucent only along margins) (0.2–) 0.3–0.4 mm broad, which is usually long-adnate to the style bases, forming a broadly triangular or rounded-triangular apex; style bases often separated to below the edge of the wing; and inflorescences usually clavate and rather dense, or occasionally clavate-linear (the last character is very variable). Judging from the morphology of the fruits, this species is closely related to *C. americanum*.

Some European forms of the *Corispermum pallasii* aggregate, known mostly as *C. membranaceum* Iljin or *C. leptopterum* var. *membranaceum* (Iljin) Aellen, have smaller and less winged fruits, morphologically approaching *C. americanum*. The Asian relatives of *C. pallasii* are: *C. stauntonii* Moquin-Tandon, *C. elongatum* Bunge ex Maximowicz s.l. (including *C. confertum* Bunge ex Maximowicz), *C. candelabrum* Iljin, *C. bardunovii* M. Popov ex M. Lomonosova, and some other species. *Corispermum sibiricum* Iljin s. str. (subsp. *sibiricum* = subsp. *jenissejense* Iljin) is also related to this aggregate, but more distantly. *Corispermum sibiricum* subsp. *amurense* Iljin is conspecific with *C. elon-*

*gatum*. For additional information about *C. pallasii* (= *C. leptopterum*) see Iljin (1929), Aellen (1961, 1964), Strazdin'sh (1985), Köck (1986), and Mosyakin (1988b).

In the *Atlas Florae Europaeae* (Jalas & Suominen, 1980) and the second edition of *Flora Europaea* (Aellen & Akeroyd, 1993), *Corispermum pallasii* (= *C. leptopterum*) and another distinct species, *C. gallicum* Iljin, were erroneously submerged in *C. intermedium* Schweigger. The latter is a distinctive endemic of the southeastern coast of the Baltic Sea, and its differences from *C. pallasii* are numerous and evident: constant absence of perianth segments, broadly ovate or almost orbiculate fruits with broader wing rounded at the apex, etc. In spite of some similarity between the habits of *C. intermedium* and the *C. canescens* Kitaibel ex Schultes–*C. marschallii* Steven aggregate, their history and development were independent, representing two hypothetical migration routes in the westward European expansion of the genus: northern route, affected mostly by glacial factors of the Pleistocene, especially Riss-Würm/Mikulino interglacial; and southern route, affected mostly by the pre-Pleistocene and Pleistocene transgressions and regressions of inland seas. The first migration path may be traced from east to west by the present distribution of *C. algidum* Iljin (northeasternmost European Russia), *C. intermedium* (Baltic Sea coasts), and *C. gallicum* (southern France). Additional evidence supporting this geohistorical reconstruction may be found in the discovery of fossil fruits of *Corispermum* in the Late Weichselian deposits in England (ca. 42,000–45,000 years BP) and Belgium (see Godwin, 1975; Bell, 1969). The genus was not known from the British Isles in historical times until the very recent discovery of introduced *C. pallasii* reported by Gibson (1992) as *C. leptopterum*. The end of the second (southern) migration path of *Corispermum* in Europe is marked by the westernmost area of natural distribution of *C. canescens* s. str. and *C. nitidum* in the Pannonian floristic region.

Because of some parallels between arid and nutritionally deficient habitats (see Small, 1973), the xeromorphic species of *Corispermum* are well adapted to both hot deserts of central Asia and southwestern North America, and cool river shores of subarctic Siberia and Alaska. Usually they are most abundant in pioneer, marginal, and naturally and/or artificially disturbed habitats. In the Quaternary the most widescale pre-anthropogeic disturbance was caused by Pleistocene glaciations (see, e.g., Pielou, 1991); the glacial events affected both distribution and evolution of many species with "weedy" life strategies (see Harlan & de Wet, 1965). An excellent example of a response of "weedy" species to the glacial and post-glacial events of the late Pleistocene and Holocene is *Ambrosia* L. (see Bassett & Terasmae, 1962).

I believe that the Pleistocene glaciations and early Holocene post-glacial events played an important role in the history of *Corispermum*. Expansions and retreats of glaciers, as well as eustatic and isostatic sea level changes, created many pioneer, marginal habitats, especially fluvioglacial, alluvial, littoral deposits in coastal and limnetic areas, river valleys, etc. Abundance of such habitats provided excellent migration routes for ancestors of modern species of *Corispermum*. Since some evidence exists that paleo-Americans collected and consumed *Corispermum* fruits (see Betancourt et al., 1984), the possible role of prehistoric people in the local dispersal of seeds should also be taken into consideration.

More detailed reconstruction of the history of distribution and migration of *Corispermum* during the Pleistocene and Holocene will be published later. However, it seems to be useful to mention some basic considerations concerning the history of the genus in North America.

*Corispermum* was present in North America at least 38,000 years BP (before present) in Alaska and the Yukon, 11,000–14,000 years BP in Arizona and Utah, ca. 4,000 years BP in New Mexico (for details see Betancourt et al., 1984; Matthews, 1982; Rosendahl, 1948; Young, 1982).

In my opinion, ancestors of the modern native North American taxa of this genus migrated to non-glaciated parts of Alaska and the Yukon through the Bering Land Bridge after the Pelukian (Kazantsevo/Sangamon) sea transgression, most possibly after Zyryanka/Early Wisconsin glaciation, during the Kargin (Zyryanka-Sartan) interstadial. Their further southward expansion became possible after the retreat of Late Wisconsin glaciers and separation of Laurentide and Cordilleran ice sheets. There is also the possibility of their migration to more southern parts of North America during the Middle Wisconsin interstadial; this helps to explain the most ancient records of fossil *Corispermum* fruits in the southwestern United States.

Judging from the present distribution of *Corispermum* species and available fossil records of the genus, there were at least three main paleo-migration routes of ancestors of modern taxa in North America. All these routes started in non-glaciated parts of Beringia. The Pacific route followed the coastal line of the Pacific Ocean and main river valleys of northwestern North America. This route

seems to be the main migration path for ancestors of *C. pacificum* and *C. pallidum*. The two other migration corridors are marked by the present distribution of species of the *C. pallasii–C. americanum* aggregate. One of these reconstructed routes went southward and partly southwestward along the Rocky Mountains and adjacent plains, and another crossed Canada in a southeastern direction toward the Great Lakes. During their expansion, species of *Corispermum* probably followed shorelines of Pleistocene glacial and post-glacial paleo-lakes (Agassiz, McConnell, precursors of the Great Lakes, etc.) and ancient river valleys, as well as fluvioglacial deposits exposed after the retreat of glaciers.

## Validation of New Taxa

As stated above, *Corispermum* is represented in North America by several native species belonging to at least three species aggregates (species groups). Five of these species are described below.

**Corispermum pacificum** Mosyakin, sp. nov. TYPE: U.S.A. Washington: Wawawai, apparently introduced, Oct. 1893, *C. V. Piper 1770* (Native ! 1900 C. V. P.) (holotype, GH; isotypes, F, GH, MIN, MO, NY, UC). Figure 1A.

Planta annua, ca. 15–40 cm alta, a basi ramosa, glabra vel sparsim stellato-pilosa (saepissime in partibus juvenalibus). Folia 2–5(–7) cm longa, 0.2–0.6 mm lata, anguste lanceolata, lineari-lanceolata vel linearia, plana, apice brevissime mucronulata. Inflorescentia plerumque compacta, densa vel rarius plus minusve remotiflora, apice solum congesta; ovoidea, elongato-ovoidea, elongato-clavata, rarius late linearia. Bracteae saepissime (1.0–)1.5–2.5 cm longae, 0.3–0.7(–0.9) cm latae; ovato-lanceolatae, anguste ovato-lanceolatae, ovatae, lanceolatae, apice acuminatae; saepissime late membranaceo-marginatae, imbricatim dispositae. Perianthium monophyllum, apice denticulatum. Fructus maturi 3.0–4.0 × 2.7–3.8 mm, subrotundati vel rotundato-obovati, per lineam mediam latissimi vel rarius leviter supra medium, in fronte paulo convexi vel rarius subplani, a tergo plerumque plani vel leviter concavi, nitiduli, alati; ala plerumque (0.2–)0.3–0.6 mm lata, membranacea, subpellucida, margine undulata vel irregulariter minutissime denticulata (rarius integerrima), apice rotundata vel rarius subemarginata; nucleus maturus saepissime niger, rarius atro-olivaceus.

Annual plant ca. 15–40 cm tall (or occasionally more?), usually branched from the base; glabrous, or sparsely covered with branched and almost stellate hairs (especially when young). Leaves usually 2–5(–7) cm long, 0.2–0.6 mm broad, narrowly lanceolate, linear-lanceolate, or linear; flat or nearly so; short-mucronulate at apex. Inflorescences usually compact, rather dense, or sometimes ± lax, condensed only near the apex; ovate, ovate-elongate, obovate, elongate-clavate, or occasionally broadly linear. Bracts (1.0–)1.5–2.5 *cm long*, 0.3–0.7(–0.9) cm broad; ovate-lanceolate, narrowly ovate-lanceolate, almost ovate, or lanceolate, acuminate at apex; usually with broad membranous margins; overlapping. Perianth segment 1, with erose or denticulate apex. Mature fruits usually 3.0–4.0 × 2.7–3.8 mm, almost orbicular or orbicular-obovate in outline, broadest near the middle (or rarely slightly above the middle); slightly convex (rarely almost flat) at the abaxial side, flat or slightly concave at the adaxial side; shiny; winged. Wing usually (0.2–)0.3–0.6 mm broad, thin, translucent; slightly undulate or indistinctly erose-denticulate at margins; rounded or rarely indistinctly emarginate (notched) at apex. Mature fruit body (nucula, "kernel") in most cases black (rarely deep olive green), sharply contrasting with greenish semi-transparent wings.

*Corispermum pacificum* is not closely related to other native or introduced North American taxa. Its closest allies are Siberian *C. crassifolium* Turczaninov and *C. maynense* Ignatov. The latter species occurs in the northeastern Russian Far East and may be expected to occur in Alaska and/or northwestern Canada. *Corispermum pacificum* differs from *C. maynense* by its usually more robust habit, and its wing rounded (rarely rounded-truncate or indistinctly emarginate, but not triangular) at apex. From *C. crassifolium* it may be distinguished by the constant presence of perianth segments, and more flattened black mature fruits. At present *C. pacificum* is known to me only from cited localities in Washington, Oregon, and northwestern Idaho, but it probably also occurs in adjacent regions of British Columbia.

The specimens of this species were misidentified by Maihle and Blackwell (1978) partly as *Corispermum hyssopifolium*, and partly as *C. nitidum*. I do not agree with these determinations, nor with reasons for splitting *C. pacificum* into two species.

*Paratypes.* U.S.A. **Idaho:** Nez Perce Co., sandy island in Clearwater River, opposite Lewiston, 12 Oct. 1924, *H. St. John 6792* (UC). **Oregon:** Howell's Pacific Coast Plants, Josephine Co., Grant's Pass, Sep. 1887, *Thomas Howell s.n.* (OSC); Multnomah Co., sandy bar on the Columbia River just E of the "Interstate Bridge," 23 Sep. 1915, *M. A. Flinn s.n.* (OSC); Plants of Oregon. Sand bar on Hayden Island opposite Vancouver, Washington, 11 Oct. 1919, *J. C. Nelson 2955* (GH); Whitman Co., Wawawaii, Snake River, dry river sands, 13 Oct. 1923, *F. A. Warren 168* (NY); Flora of Northwest America. Sandy ground, Hayden Island, Oregon, 8 Oct. 1927, *J. W. Thompson 3915* (MO, PH); Hood River Co., sandy muddy bank of the Columbia River, with *Riccia* and *Cyperus*, about 15–20 mi. W of the Dalles, Oregon, 22 Oct. 1961, *Georgia Mason 4201* (OSC). **Washington:** Flora of Washington Territory. Northern Transcontinental Survey, Yaki-

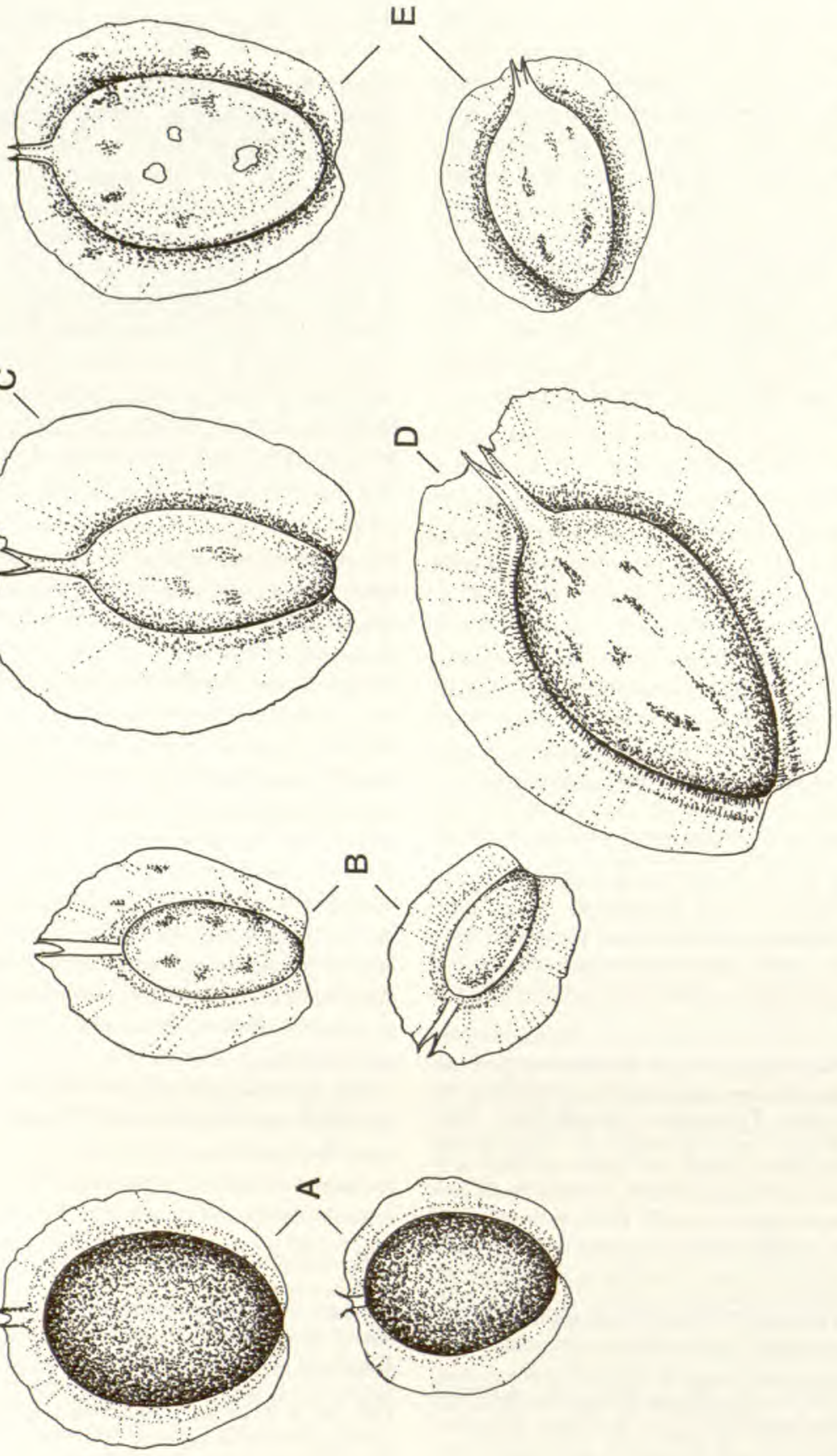


Figure 1. Fruits of *Corispermum*: comparison between North American and Asian species. —A. *Corispermum pacificum* (North America). —B. *Corispermum platypterum* (Asia). —C. *Corispermum macrocarpum* (Asia). —D. *Corispermum pallidum* (North America). —E. *Corispermum welshii* (North America).

ma Region, sands of the Columbia, Oct. 1882, *Frank Tweedy s.n.* (NY); W. Klickitat Co., sandy banks of the Columbia River, 11 Sep., 29 Oct. 1893, *W. N. Suksdorf 1385* (F, GH, MIN, MO, NY, UC) [A mixed collection; see note below—S.M.]; Klickitat Co., Spedio, sandy shores and sandy slopes, very common, 19 Sep. 1925, *M. W. Gorman s.n.* (OSC); Whitman Co., sandy bank of the Snake River at Wawawai, 15 Oct. 1939, *Marion Ownbey & Ruth P. Ownbey s.n.* (CAN, GH, OSC, PH, RM, RSA, TEX, UC); Whitman Co., Wawawai–Lewiston road along Snake River, on sandy beach at edge of river, 15 Sep. 1956, *R. T. Ogilvie s.n.* (DAO, UBC).

Some degree of reproductive isolation between the sympatric species of *Corispermum* exists because of different phenology, especially different flowering period. However, occasional hybrids probably occur between partly sympatric *C. pacificum* and *C. villosum*. These hybrids are similar in habit to *C. pacificum*: they have usually broad leaves and dense inflorescences. However, many of their fruits (up to 50–70%) are abortive, almost lacking a perisperm. Occasional well-developed fruits are polymorphic and show transitional characters: they are usually narrow-winged or almost wingless, strongly convex at the abaxial side (characters of *C. villosum*), black or nearly so, broadly ovate to orbiculate in outline (characters of *C. pacificum*). The high percentage of abortive fruits indicates that *C. pacificum* and *C. villosum* are taxonomically rather distant species, because hybrids between closely related taxa of *Corispermum* (i.e., belonging to the same species aggregate) usually show no evident loss of fertility. The studied specimens of *C. pacificum* × *C. villosum* are cited below:

U.S.A. **Oregon:** Umatilla Co., mouth of Umatilla River, Umatilla, 11 July 1915, *M. E. Peck 6667* (OSC); along Columbia, opposite Dalles, Oregon, 1915, *J. Evans s.n.* (OSC); Baker Co., 28 Nov. 1952, *LeRoy Wright s.n.* (OSC); Hood River Co., drifting sand of the Columbia River, 10 Sep. (fl), 1 Oct. 1923 (fr), *L. F. Henderson 344* (of 1924) (MO). **Washington:** Wallula, sandy soil, alt. 220 m, 17 Sep. 1894, *J. B. Leiberg 912* (OSC).

**Corispermum pallidum** Mosyakin, sp. nov. TYPE: U.S.A. Washington: Douglas Co., in drifting sand, Wilson Creeks, 25 July 1893, *J. H. Sandberg & J. B. Leiberg 309* (holotype, MO; isotypes, CAN, F, OSC, PH, UC, US). Figure 1B.

Planta annua, ca. 5–25 cm alta, a basi ramosa, subglabra vel in partibus juvenalibus stellato-pilosa et minutissime papillosa. Folia 2–5 cm longa, 0.1–0.2(–0.3) cm lata, linearia, anguste linearia vel filiformia, plana vel partim convoluta, apice brevissime mucronulata. Inflorescentia plerumque laxiuscula, rarius densiuscula; linearia vel elongato-linearia. Bracteae (0.5–)1.0–1.5(–2.0) cm longae, 0.2–0.5 cm latae; plerumque anguste ovato-lanceolatae vel lanceolatae, apice acuminatae; saepissime membranaceo-marginatae, imbricatim dispositae vel plus minusve remotae. Perianthium monophyllum, apice denticulatum. Fructus maturi saepissime 2.8–3.5(–3.8) × 2.4–2.8(–3.3) mm, rotundato-obovati vel obovati, plerumque supra medium vel rarius per lineam mediam latissimi, in fronte subplani vel subplano-convexi, a tergo plerumque plani vel leviter concavi, subnitidi vel opaci, alati; ala plerumque 0.7–1.0 mm lata, membranacea, subpellucida, margine erosa vel irregulariter eroso-denticulata (rarius subintegra), apice stylorum basi longe adnata, emarginata vel rotundata; incisura inter basin stylorum margine alarum profundiore; nucleus maturus pallidus, stramineus vel brunneus, saepe maculatus.

Annual plant ca. 5–25 cm tall (or more?), branched from the base, almost glabrous, or covered with branched and almost stellate hairs and minute papillae (especially on veins of young bracts and upper leaves). Leaves 2–5 cm long, 0.1–0.2(–0.3) cm broad, linear, narrowly linear, or filiform; flat or occasionally convolute (especially at maturity); acuminate or short-mucronulate at apex. Inflorescences usually lax, rarely rather dense; linear or elongate-linear. Bracts usually (0.5–)1.0–1.5(–2.0) cm long, 0.2–0.5 cm broad, usually narrowly ovate-lanceolate or lanceolate, acuminate at apex; in most cases with distinctly membranous margins; overlapping or slightly remote. Mature fruits 2.8–3.5(–3.8) × 2.4–2.8(–3.3) mm, rounded-obovate or obovate in outline, usually broadest above the middle or occasionally near the middle; almost flat or slightly convex at abaxial side, plane or slightly concave at adaxial side; slightly shiny or dull; winged. Wing normally 0.7–1.0 mm broad, thin, translucent, with erose or irregularly erose-denticulate (rarely almost entire) margins; long-adnate to the style bases, emarginate (notched) or rounded at apex. Style bases unusually long (ca. 0.7–1.0 mm, including their parts adnate to wing), in most cases divided to below the edge of the wing. Mature fruit body ("kernel," nucula) flattened, pale, usually straw-colored or yellowish brown, occasionally with reddish brown spots.

*Corispermum pallidum* seems to be a well-defined species. The combination of its characters is very distinctive: pale, flattened, and small fruit body; very broad (especially as compared to the fruit dimensions), thin translucent wing with erose margins; and long style bases distinctly divided in their upper parts. Young bracts and upper leaves of *C. pallidum* are often papillose on margins and veins, in combination with typical branched trichomes. This character (papillosity) is quite rare in *Corispermum*, since most of its species are normally covered only with branched or almost stellate hairs. The same combination of branched hairs and min-

ute papillae occasionally occurs in some Asian species. It is hard to believe, but *C. pallidum* seems to be most closely related to the eastern Asian species *C. macrocarpum* Bunge ex Maximowicz, which occurs at present in the southern Russian Far East and northeastern China, mostly along the Amur River and some of its tributaries. Two Manchurian species, *C. stenolepis* Kitagawa and *C. platypterum* Kitagawa, also belong to the same aggregate (for additional information about these Asian taxa, see Kitagawa, 1935; Baranov, 1969; Tsien Cho-po & Ma Cheng-gung, 1979). Fruits of *C. pallidum* are very similar to those of *C. macrocarpum* in their morphological features, but not in their size; the latter species has much larger fruits 5.0–6.0(–6.5) × 3.8–5.5 mm (Fig. 1B–D).

Maihle and Blackwell (1978) placed rather uniform specimens of *Corispermum pallidum* into two taxa, *C. hyssopifolium* sensu Maihle & Blackwell (*Sandberg & Leiberg 309, Thompson 6764*) and *C. nitidum* sensu Maihle & Blackwell (*St. John, Courtney & Parker 4948*).

*Paratypes.* U.S.A. **Washington:** Flora of Eastern Washington. Wilson Creek, July 1893, *J. H. Sandberg & J. B. Leiberg s.n.* (MIN); Grant Co., dry sand, SW of Moses Lake, alt. 1000–1150 ft., 25 June 1921, *Harold St. John, W. D. Courtney & Charles S. Parker 4948* (GH, UC); Grant Co., sandy sagebrush plains near Quincy, 15 June 1931, *J. William Thompson 6764* (GH, MO).

**Corispermum welshii** Mosyakin, sp. nov. TYPE: U.S.A. Utah: Kane Co., sand dunes, with ponderosa pine, willow, and gambel oak, ca. 1900 m, Coral Pink Dunes, T43S, R8W, S8, ca. 8 mi. due W of Kanab, 25 Sep. 1992, *S. L. Welsh & K. H. Thorne 25170* (holotype, MO; isotypes, BRY, NY). Figure 1E.

Planta annua, ca. 10–35 cm alta, a basi ramosa, dense vel sparsim stellato-pilosa. Folia 2–6 cm longa, 0.2–0.4(–0.5) cm lata, lineari-lanceolata vel linearia, fere plana vel rarissime partim subconvoluta, apice brevissime mucronulata. Inflorescentia plerumque compacta, densa vel rarius plus minusve laxiuscula, apice congesta; ovoidea, elongato-obovata vel elongato-clavata. Bracteae 1.0–3.0 cm longae, 0.3–0.8 cm latae; ovatae vel ovato-lanceolatae, rarius anguste ovato-lanceolatae, apice acuminatae; late membranaceo-marginatae, imbricatim dispositae. Perianthium monophyllum, apice denticulatum. Fructus maturi saepissime (3.3–)3.7–4.6 × (2.7–)3.0–3.6 mm, obovati vel rotundato-obovati, plerumque supra medium vel rarius per lineam mediam latissimi, in fronte convexi, a tergo plerumque leviter concavi, subnitidi vel opaci, alati; ala plerumque (0.3–)0.4–0.6 mm lata, membranacea, subpellucida (rarius valdiuscula, margine solum subpellucida), margine integra vel irregulariter eroso-denticulata, apice rotundata, truncata vel subemarginata; nucleus maturus stramineus, fulvus vel brunneus, saepissime maculatus et albido-verrucosus.

Annual plant ca. 10–35 cm tall (or more?), branched from the base or nearly so, densely or sparsely covered with branched or stellate hairs. Leaves 2–6 cm long, 0.2–0.4(–0.5) cm broad, linear-lanceolate or linear, usually plane, or rarely slightly convolute or folded (especially in dried plants), short-mucronulate at apex. Inflorescences usually rather compact and dense, rarely ± lax, condensed only at apex; ovate, oblong-obovate, or oblong-clavate in outline. Bracts 1.0–3.0 cm long, 0.3–0.8 cm broad, ovate or ovate-lanceolate (rarely narrowly ovate-lanceolate), acuminate at apex, with broad membranous margins. Perianth segment 1, minutely dentate at apex. Mature fruits normally (3.3–)3.7–4.6 × (2.7–)3.0–3.6 mm, broadly obovate or obovate-orbicular in outline, in most cases broadest above the middle (rarely near the middle); convex at abaxial side, usually concave at adaxial side; slightly shiny or dull; winged. Wing usually (0.3–)0.4–0.6 mm broad, thin, translucent (or occasionally more thick, translucent only at margin), with entire or irregularly erose-denticulate margins; rounded, truncate, or indistinctly emarginate at apex. Mature fruit body (nucula, "kernel") straw-colored (yellowish brown), light brown or brown, usually with reddish brown spots and whitish warts.

This species is probably closely related to the broad-winged and large-fruited plants of the southwestern U.S.A. (*Corispermum americanum* var. *rydbergii* Mosyakin), which Rydberg included in his *C. marginale* (excluding the type of *C. marginale*). However, *C. welshii* differs from the mentioned variety, as well as from *C. americanum* sensu proprio, in having shorter, broader, and denser spikes, distinctly broader leaves and bracts, more rounded (occasionally almost orbicular), and often more prominently winged fruits. Its difference from *C. villosum* is also evident, since it has larger fruits approximately twice as long and broad as the latter. From *C. pallasii* it may be distinguished by its more orbicular fruits having membranaceous wings, which are rounded, rounded-truncate, or indistinctly emarginate at apex. In general appearance *C. welshii* resembles some eastern Asian taxa, for example, *C. elongatum* s.l. It is also somewhat similar in habit to European *C. marschallii* but is not closely related to it. At present *C. welshii* is known to me only from Utah and Wyoming, but similar forms (which are in need of additional study) occur also in other southwestern states, particularly in Colorado and western Texas. For example, the following collection from western Texas probably also belongs to *C. welshii* (it differs from typical plants in having more lax spikes and prostrate habit, but the fruits

are almost identical to those of the type): Flora of Texas. Gypsum, Hudspeth Co., from 13 mi. E of Dell City on nearly barren gypsum dunes, 14 Oct. 1984, *R. D. Worthington 12752* (TEX).

*Paratypes.* U.S.A. **Utah:** Millard Co., sand dunes, alt. 4500 ft., 18 Sep. 1926, collected by Cottam, determined by *Garrett 1010* (BRY); Millard Co., juniper association, sand dunes, 18 Sep. 1926, *coll. A. O. Garrett 1010* (RM); Salt Lake Co., South Salt Lake City, just S of intersection of 7400 South and 20th East in a sand dune area, alt. 4650 ft., T. 25, R. 1 E., SE ¼ of Sec. 28, 29 Oct. 1967, *L. Arnow 805* (GH), *805a* (COLO); Kane Co., Halls Creek Bay, Lake Powell, sandy benchland, 4 June 1972, *S. L. Welsh & G. Moore 11797* (BRY) [this plant evidently was buried by sand, and because of this it has developed atypically long branches—S.M.]; Kane Co., Coral Pink Sand-dunes State Park S of Mt. Carmel Junction, elev. 5500 ft., 11 Oct. 1972, *B. Albee 1215* (UT); Uintah Co., T3S, R22E, SW Sec. 4, Red Fleet Reservoir, ca. 6000 ft. elev., opens in juniper community, sandy soil, 3 Oct. 1980, *E. Neese & M. Chatterley 9894* (NY, RM) [these specimens have fruits slightly smaller than in the type—S.M.]; Kane Co., Navajo Sandstone, Ponderosa, Oakbrush community, T43S R7W S30, Moquith Mountain, ca. 7 mi. W of Kanab, 2142 m elev., 25 Sep. 1992, *K. Thorne & S. L. Welsh 15192* (BRY) [also a specimen with slightly smaller fruits—S.M.]. **Wyoming:** Sweetwater Co., sand dunes, near Steamboat Mt., 1 Sep. 1936, *Marion Ownbey & Robert L. Lang 1122* (COLO); Niobrara Co., T34N R61W Sec 36 SE ¼, sandy roadside, associates: *Cenchrus, Salsola*; elev. 4700 ft., 26 Sep. 1986, *R. Dorn 4549* (NY) [inflorescences of this specimen are more lax than in the type, showing a transition toward *C. americanum*—S.M.].

**Corispermum navicula** Mosyakin, sp. nov. TYPE: U.S.A. Colorado: Jackson Co., North Park, North sand dunes due E of Dowell Ranch, T10N, R78W, Sec. 6, between Government Creek and North Sand Creek, Eagle Hill Quadr., 29 Sep. 1976, *F. Martin Brown s.n.* (holotype, COLO).

Planta annua, ca. 5–15(–25?) cm alta, a basi ramosa, sparsim stellato-pilosa vel glabriuscula. Folia (1.5–)2–4 cm longa, 0.1–0.5 cm lata, anguste lanceolata vel linearilanceolata, plana, rarissime partim convoluta. Inflorescentia plerumque compacta, densa, ovoidea vel elongato-ovoidea. Bracteae 0.5–2.0 cm longae, 0.2–0.6 cm latae; imbricatim dispositae. Perianthium monophyllum. Fructus maturi (4.2–)4.5–5.0(–5.2) × 2.5–3.0 mm, elongato-obovati, supra medium latissimi; in fronte valde convexi, a tergo plerumque distinctissime concavi; apteri vel anguste alati. Ala plerumque 0.1–0.2(–0.3) mm lata, valdiuscula, non pellucida vel semipellucida; margine integerrima vel minutissime eroso-denticulata, saepe involuta; apice rostrata, triangularia, stylorum basi longe adnata. Nucleus maturus atro-brunneus vel atro-viridis, plerumque maculatus et/vel albido-verrucosus.

Annual plant ca. 5–15(–25?) cm tall, branched from the base, sparsely covered with branched and almost stellate hairs, or almost glabrous. Leaves (1.5–)2–4 cm long, 0.1–0.5 cm broad, narrowly lanceolate or linear-lanceolate, flat or rarely convolute. Inflorescences usually compact and dense, ovate or oblong-ovate in outline. Bracts 0.5–2.0 cm long, 0.2–0.6 cm broad, strongly imbricate. Perianth segment 1. Mature fruits (4.2–)4.5–5.0(–5.2) × 2.5–3.0 mm, elongate-obovate or narrowly obovate-elliptic, broadest above the middle; strongly convex at abaxial side, usually prominently concave at adaxial side; narrowly winged or almost wingless. Wing usually 0.1–0.2(–0.3) mm broad, rather thick, not translucent, or semi-translucent; with entire or indistinctly erose margins, often involute toward the adaxial side; rostrate-triangular and long-adnate to style bases at apex. Mature fruit body (nucula, "kernel") usually dark brown or dark green, usually with dark spots and whitish warts.

This species is amazingly similar in its fruit morphology to the Siberian species *Corispermum bardunovii* M. Popov ex M. Lomonosova (see M. N. Lomonosova, 1992). *Corispermum navicula* and *C. bardunovii* probably represent results of parallel evolution (or parallel variability?) within North American and Asian representatives of the *C. pallasii* aggregate, respectively. It is also worth mentioning that the most distinctive characters of *C. navicula* and *C. bardunovii*, such as elongated fruit body with almost parallel margins in the middle portion and distinctly triangular apex, show a transition (or a parallel evolutionary trend?) toward the representatives of *Corispermum* sect. *Declinata* Mosyakin (1994). Additional study of *C. navicula* is desirable for clarification of its relationships with other species. Some specimens from Oklahoma (e.g., Stillwater, Oklahoma, in sand on bank of Cimarron, 6 Nov. 1899, *E. E. Bogue s.n.*, MIN) probably also belong to *C. navicula*, or at least approach this species most closely.

*Paratype.* U.S.A. **Colorado:** Jackson Co., North Sand Hills, E of Cowdrey, T10N, R78W, S6 NE ¼, 2575 m, 1 Oct. 1982, *D. H. Wilken 13924* (NY, RM).

**Corispermum hookeri** Mosyakin, sp. nov. TYPE: Canada. Saskatchewan: District de Moose Jaw, palier sablonneux au pied du Coteau du Missouri, 5–6 mi. à l'est de Mortlach, dune éventrée, 11 Sep. 1960, *B. Boivin & G. F. Ledingham 14079* (holotype, DAO; isotypes, NY, TRT, UBC).

Planta annua, ca. 10–40 cm alta, a basi ramosa, sparsim stellato-pilosa vel glabriuscula. Folia 2–5 cm longa, (0.1–)0.2–0.5(–0.6) cm lata, anguste lanceolata vel lineari-lanceolata, plana. Inflorescentia plerumque densa ovoidea, ovato-clavata vel ovato-cylindrica, rarissime interrupta. Bracteae 0.5–1.5(–2.0) cm longae, 0.3–1.0 cm latae, ovatae vel ovato-lanceolatae, imbricatim dispositae.

Perianthium monophyllum. Fructus maturi (3.2–)3.5–4.5(–5.0) × 2.2–3.3(–3.5) mm, elongato-obovati vel obovati, per lineam mediam latissimi vel leviter supra mediam latiores; in fronte valde convexi, a tergo concavi vel subplani; apteri vel angustissime alati. Ala ad 0.2 mm lata, semipellucida; margine integerrima, apice rotundata vel leviter triangularia. Nucleus maturus atro-olivaceus, brunneus vel rarissime niger, plerumque non maculatus et non verrucosus, rarius maculatus.

Annual plant ca. 10–40 cm tall (or occasionally more?), branched from the base, sparsely covered with branched and almost stellate hairs. Leaves usually 2–5 cm long, (0.1–)0.2–0.5(–0.6) cm broad, narrowly lanceolate or linear-lanceolate, plane. Inflorescences usually dense, ovate, ovate-clavate, or ovate-cylindric, rarely interrupted (especially near the base). Bracts 0.5–1.5(–2.0) cm long, 0.3–1.0 cm broad, ovate or ovate-lanceolate, imbricate (usually strongly overlapping). Perianth segment 1. Mature fruits (3.2–)3.5–4.5(–5.0) × 2.2–3.3(–3.5) mm, oblong-obovate or obovate, broadest near the middle or slightly above the middle; strongly convex at abaxial side, prominently concave to subplane at adaxial side; wingless or narrowly winged. Wing (when present) up to 0.2 mm broad, semitransparent; margins entire, apex rounded or indistinctly triangular. Mature fruit body (nucula, "kernel") usually deep olive green, brown, or rarely almost black, normally without spots and/or warts, or occasionally spotted.

This species seems to be most closely related to *Corispermum pallasii* s. str. and *C. ochotense* var. *alaskanum* (see discussion above and comments on *C. ochotense* below). It is also similar to the small-fruited species, *C. villosum*, and to the large-fruited *C. navicula* described above. Some specimens of *C. hookeri* from British Columbia have unusually elongated fruits somewhat similar to those of Asian species of *Corispermum* sect. *Declinata*. These plants are described below as a new variety.

*Paratypes.* CANADA. **Alberta:** Lethbridge, 27 Aug. 1911, *M. O. Matt s.n.* (CAN); Battle River, S of Wainwright, sandy soil, near river bank, 8 Sep. 1951, *E. H. Moss 9725* (DAO) [the voucher specimen: $2n = 18$, determined by G. A. Mulligan]; SW of Orion, sand dunes, grazed by livestock in the area, 28 Aug. 1952, *E. H. Moss 10110* (CAN). **British Columbia:** very common on Dryas Island in Fraser River at Hope, 19 July 1914, *T. L. Thacker s.n.* (UBC); Lytton, 26 Sep. 1922, *W. B. Anderson 6678* (V); in sand landfill near Alex Fraser Bridge, Annacis Island, many plants in sand, 7 Sep. 1988, *Frank Lomer s.n.* (UBC); sandy ground under the Pattullo Bridge, Surrey, a single plant, 7 Sep. 1991, *Frank Lomer s.n.* (UBC); Steveston, Richmond, Lulu Island, 49°07′N, 123°10′W, 7 Sep. 1992, *Huber Moore & Terry Taylor s.n.* (UBC); sand landfill dredged from Fraser River, near Fraser Surrey Docks, Surrey, many plants in sand, 27 Aug. 1993, *Frank Lomer s.n.* (UBC) [this plant is transitional toward *C. hookeri* var. *pseudodeclinatum* Mosyakin described below—S.M.]. **Manitoba:** sand hill 35 mi. SE of Brandon, 23 Sep. 1960, *G. A. Stevenson 2255* (CAN, DAO). **Northwest Territories:** Mackenzie District, in dry sand near shoreline, sand hills on S shore of Mackenzie River about 16 mi. downstream from Fort Simpson, 61°58′N, 121°45′W, 25 July 1955, *W. J. Cody & J. M. Matte 8944* (DAO) [the specimen is immature; fortunately, authors also collected some fragments of dry plants remaining from the previous year—S.M.]; Mackenzie District, occasional in disturbed sand along roadside on mainland about 1 mi. S of Fort Simpson island, 61°52′N, 121°22′W, 3 Aug. 1955, *W. J. Cody & J. M. Matte 9130* (DAO) [the specimen is immature, but very similar to the previous one—S.M.]. **Ontario:** Sarnia, Oct. 1936, *W. A. Dent s.n.* (DAO); Norfolk Co., Long Point, 22 Sep. 1946, *F. A. Clarkson 6684* (DAO) [a specimen with the same collection number at TRT approaches *C. pallasii*—S.M.]; Long Point Village, sand on open shore, 24 Sep. 1966, *R. Beschel 15722* (CAN); Norfolk Co., Long Point, South Walsingham Tp., 12 Oct. 1969, *P. M. Catling & J. E. Cruise s.n.* (TRT); Norfolk Co., Long Point, along S shore E of Courtright Ridge, Lake Erie, blow-out on sand dune, 23 Sep. 1976, *K. M. Lindsay & I. D. MacDonald 1092* (CAN); Bruce Co., boundary between Chiefs' pt. I.R. and Amabel Twp., on sand, beside road at edge of pine plantation, 29 Sep. 1977, *Joseph W. Johnson* (TRT); Norfolk Co., Long Point, Squires Ridge to Little Creek Ridges, 12½ to 14½ mi. from base of Point, on S beach, open, active sand dunes along beach, numerous, with *Ammophila breviligulata* and *Andropogon scoparius*, 20 Sep. 1979, *A. A. Reznicek & P. M. Catling 5255* (DAO). **Saskatchewan:** Beaver Creek, sandy hillside, 9 Sep. 1937, *W. J. White s.n.* (TRT); Saskatoon, on sands by river, Sep. 1931, *A. W. Anderson s.n.* (CAN); Saskatoon, 20 mi. SW at Pike Lake, partially covered sand dunes, 10 Sep. 1951, *G. F. Ledingham 1219* (DAO); Moose Jaw Region, Caron, SW ¼ 16–17–29 W. 2nd, shifting sand in and around blow-out spots, long-abandoned land, 24 Sep. 1955, *T. H. Hudson 1768* (DAO); District de Rosetown-Biggar, coulée Agassiz, Canton Bernard, 12–15 mi. au sud-est de Demaine, Platières de la Saskatchewan-Sud, dune en mouvement, 18 Sep. 1960, *B. Boivin 14156* (DAO); Saskatoon District, Saskatoon, sandflat between natural levée and cutbank of S Sask. River, local, with *Elymus canadensis*, *Psoralea lanceolata*, 13 Sep. 1964, *J. H. Hudson 2214* (DAO); Lake Atabasca, E of William Point, *Salix*, *Myrica* on dry, eroding sand beach on shore, 6 Aug. 1975, *G. W. Argus & D. J. White 9750* (CAN) [inflorescence interrupted—S.M.].

**Corispermum hookeri** Mosyakin var. **pseudodeclinatum** Mosyakin, var. nov. TYPE: Canada. British Columbia: beside Burnaby Lake, sand dune, 3 Oct. 1965, *I. Bayly 83* (holotype, UBC).

Fructus elongati vel oblongo-obovati, longitudine latitudinem duplo vel subduplo superanti; in fronte valde convexi, a tergo concavi. Inflorescentia elongata, interrupta, apice solum congesta.

Fruits elongate, oblong-obovate, ca. 2 times as long as broad; prominently convex at abaxial side, concave at adaxial side. Inflorescences elongate, interrupted, condensed only at apex.

*Paratype.* CANADA. **British Columbia:** Okanagan, Quilchena, 30 July 1906, *E. Wilson 776* (UBC).

**Corispermum americanum** (Nuttall) Nuttall var. **rydbergii** Mosyakin, var. nov. TYPE: Mexico. Chihuahua: sand dunes, 10–19 Oct. 1935, *Harde LeSueur 285* (MO).

Fructus maturi (3.2–)3.5–4.0(–4.3) × 2.3–3.2 mm, saepissime late alati, supra medium latissimi. Ala 0.3–0.4(–0.5) mm lata. Inflorescentia plerumque angusta, laxiuscula, non densa, plus minusve remotiflora. Ceterum typo respondet.

Mature fruits (3.2–)3.5–4.0(–4.3) × 2.3–3.2 mm, usually broadly winged, broadest above the middle. Wing 0.3–0.4(–0.5) mm broad. Inflorescences normally narrow, lax; flowers/fruits ± remote. Other characters as in *C. americanum* var. *americanum.*

*Paratype.* U.S.A. **Colorado:** Huerfano Valley, near Gardner, sandy creek bottom, alt. 7000 ft., 10 Sep. 1900, *F. K. Vreeland 657* (NY, CAN) [this specimen is also a paratype of *C. marginale* Rydberg; see discussion above—S.M.].

Because the *Corispermum americanum* group is currently under revision, I refrain now from citing additional paratypes of this variety. However, it seems to occur in several localities in Arizona, Colorado, New Mexico, Texas, and Utah. New collections of mature specimens from this region would be extremely helpful for detailing its distribution. Due to its characteristic narrow and interrupted inflorescence, this variety, as well as many specimens of *C. americanum* s. str., was constantly misidentified as *C. nitidum.*

**Corispermum ochotense** Ignatov var. **alaskanum** Mosyakin, var. nov. TYPE: U.S.A. Alaska: Onion Portage, Upper Kobuk River, 67°06′N, 158°15′W, in sand dunes, open site, 10 Aug. 1967, *Charles Schweger 196* (holotype, ALA).

Fructus maturus 3.2–4.0 mm longus, 2.2–2.7 mm latus. Ceterum ut in var. *ochotense.*

Mature fruit 3.2–4.0 mm long, 2.2–2.7 mm wide. Other characters as in variety *ochotense.*

*Paratypes.* U.S.A. **Alaska:** Yukon River between Rampart and Tanana, 9 Aug. 1932, *L. J. Palmer 13* (CAN); Ester Siding Field, July 1936, *G. W. Gasser s.n.* (ALA); Kobuk River valley, forming dense "stands" on sandy river bar at Point Goldie on Kobuk River, 2 Aug. 1974, *C. H. Racine 732* (ALA); Kobuk River valley, low, abundant plant covering sand surface of dunes on S side of Kobuk River opposite mouth of Hunt River, 12 Aug. 1974, *C. H. Racine 731* (ALA).

*Corispermum ochotense,* a comparatively small (often dwarf) arctic and subarctic plant, has been described recently from the northeastern Russian Far East (Ignatov, 1986). It is normally floriferous almost to the base, often developing fruits even in the axils of lower leaves and branches. The lower and middle bracts in the inflorescence are usually linear or linear-oblanceolate (often broadest toward the apex, as well as some leaves), rather long, leaflike, almost not different from cauline leaves in their shape and size. In addition, plants often turn deep beet red at maturity. The illustration of "*C. hyssopifolium*" in the *Flora of Alaska* (Hultén, 1968) gives an accurate impression of the habit of *C. ochotense.* The type of *C. ochotense* ("regio Magadan, distr. Ola, pagus Talon, syrtis arenosa riparia, 28–30 Aug. 1971, A. P. Khokhrjakov"), which I have studied at MHA, is conspecific with the Alaskan and northwestern Canadian plants. However, some of the Alaskan specimens differ from their trans-Beringian relatives in having larger fruits. The typical variety of *C. ochotense* also occurs in North America. The species is known to me from the following additional localities in Canada (as many specimens were not completely mature, the varieties are not indicated; however, most of the specimens seem to belong to var. *ochotense*):

CANADA. **Northwest Territories:** District of Mackenzie, Aklavik River near Aklavik, on the section of slit beach, 6 Sep. 1948, *Margaret E. Oldenburg 48–1241* (GH); Mackenzie District, Norman Wells, forming thick mats on eroding heavy soil on slope by airstrip, 22 July 1953, *W. J. Cody & R. L. Gutteridge 7466* (COLO, DAO, GH, MICH, MO, OSC, TRT, UBC); Mackenzie District, rare on gravel beach of Mackenzie River, Royal Canadian Corps Signals Transmitters, 5 mi. upstream from Norman Wells, 27 July 1953, *W. J. Cody & R. L. Gutteridge 7603* (DAO, F); Mackenzie District, 13.0 km WSW of Norman Wells, N.W.T. Site No. 8–10–13, beach ridge, sandy, with *Populus tremuloides,* 10 Aug. 1974, *N. J. Walker 2303* (DAO); Mackenzie District, E bank of MacKenzie River, Norman Wells, N.W.T. Site No. 8–18–1, riverbank, many disturbance species, rare, 18 Aug. 1974, *N. J. Walker 2386* (DAO).

The following collection from northern Saskatchewan probably also belongs here (although the plants were not completely mature):

CANADA. **Saskatchewan:** S shore of Lake Atabasca at Beaver Point, lower sandy beach line at, and just above, shoreline, scattered, but frequent, 8 Aug. 1979, *V. L. Harms & R. A. Wright 27215* (DAO, GH, RM).

As outlined above, the native North American species of *Corispermum* are comparable to most of the widely recognized Eurasian taxa of the genus, regarding the species concept applied to them and morphological differences between species. They are also comparable to some other readily recognized taxa of Chenopodiaceae, e.g., numerous seg-

regate species of such North American aggregates as *Chenopodium leptophyllum* s.l., or *C. fremontii* S. Watson s.l. However, especially for followers of a broader species concept, I would like to outline the species aggregates (groups) of closely related taxa of North American *Corispermum*. Because North American representatives of this genus were commonly misidentified and misunderstood, this explanation would be helpful in preventing possible further mistakes.

The closest Asian allies of American *Corispermum* are *C. pallasii* (for almost all native taxa), *C. macrocarpum* (for *C. pallidum*), and *C. crassifolium* (for *C. pacificum*). In my opinion, in the future *C. pacificum* and *C. pallidum* could not be lumped together with other North American taxa. However, using a very broad species concept, one may regard *C. pacificum* as a subspecies of *C. crassifolium*. *Corispermum pallasii* is most closely related to *C. americanum*, *C. navicula*, and *C. welshii*; under a broad species concept the three latter species could fit at the subspecies level as well. *Corispermum ochotense*, *C. hookeri*, and *C. villosum* form another unit, which is, however, connected to the previous one by occasional forms transitional between *C. americanum* and *C. villosum*, as well as by transitions between *C. pallasii* and *C. hookeri*. Using the ultra-broad species concept, one could unite the mentioned taxa under the priority name *C. pallasii*. However, I believe that at the present stage of our knowledge, such an approach could only obscure the true relationships within this group.

At present I prefer to place the native North American representatives of *Corispermum* into three species aggregates (groups):

the *Corispermum pallasii* aggregate: *C. pallasii* s. str., *C. americanum*, *C. navicula*, *C. welshii*, *C. hookeri*, *C. villosum*, *C. ochotense;* also the Asian *C. sibiricum*, *C. stauntonii*, *C. elongatum*, *C. bardunovii*, and probably some others.

the *Corispermum crassifolium* aggregate: *C. pacificum* plus the Asian *C. crassifolium* s. str. and *C. maynense*.

the *Corispermum macrocarpum* aggregate: *C. pallidum* and the Asian *C. macrocarpum* s. str., *C. platypterum*, and *C. stenolepis*.

A key to the species and species aggregates of *Corispermum* occurring in North America will be published later, in a treatment of the genus for the fourth volume of the *Flora of North America*. Natural arrangement of some Eurasian species and species aggregates will be discussed in an article submitted to the *Ukranian Botanical Journal* (*Ukrajins'kyj botaničnyj žurnal*).

New, more complete (and preferably serial) herbarium material of North American *Corispermum*, as well as field and experimental studies, would be helpful for further progress in understanding the complicated patterns of taxonomy and distribution of the genus in North America.

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## Literature Cited

Adamkiewicz, E. 1970. Studia cyto-taksonomiczne i embriologiczne nad czterema gatunkami rodzaju *Corispermum* L. (Cytotaxonomic and embryological studies on four species of the genus *Corispermum* L.). Acta Soc. Bot. Poloniae 39(4): 626–652.

Aellen, P. 1961. *Corispermum* L. Pp. 716–723 *in:* G. Hegi, Illustrierte Flora von Mitteleuropa. Aufl. 2. Bd.3. T.2. München.

———. 1964. *Corispermum* L. Pp. 99–100 *in:* T. G. Tutin et al., Flora Europaea. Vol. 1. Cambridge Univ. Press, Cambridge.

——— (revised by J. R. Akeroyd). 1993. *Corispermum* L. Pp. 119–120 *in:* T. G. Tutin et al., Flora Europaea. Ed. 2. Vol. 1. Cambridge Univ. Press, Cambridge.

Baranov, A. I. 1969. The species of *Corispermum* (Chenopodiaceae) in Northeastern China. J. Jap. Bot. 44: 161–169; 195–206.

Bassett, I. J. & J. Terasmae. 1962. Ragweeds, Ambrosia species, in Canada and their history in postglacial time. Canad. J. Bot. 40: 141–150.

Bell, F. G. 1969. The occurrence of southern, steppe and halophyte elements in Weichselian (last-glacial) floras from southern Britain. New Phytol. 68: 913–922.

Betancourt, J. L., A. Long, D. J. Donahue, A. J. T. Jull & T. H. Zabel. 1984. Pre-Columbian age for North American *Corispermum* L. (Chenopodiaceae) confirmed by accelerator radiocarbon dating. Nature 311: 653–655.

Gibson, Ch. 1992. *Corispermum leptopterum* (Aschers.) Iljin in North Essex. B.S.B.I. News, No. 62: 41–42.

Godwin, H. 1975. The History of the British Flora: A Factual Basis for Phytogeography. Ed. 2. Cambridge Univ. Press, Cambridge.

Harlan, J. R. & J. M. J. de Wet. 1965. Some thoughts about weeds. Econ. Bot. 19: 16–24.

Hooker, W. J. 1840. Flora Boreali-Americana, or the Botany of the Northern Parts of British America. 2 vols. London.

Hultén, E. 1968. Flora of Alaska and Neighboring Territories. A Manual of the Vascular Plants. Stanford Univ. Press, Stanford, California.

Ignatov, M. S. 1986. Chetyre novykh vida s Dal'nego Vostoka (Four new species from the Soviet Far East). Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 91 (3): 111–114.

Iljin, M. M. 1929. Novye vidy roda *Corispermum* L. (Corispermi generis species novae). Izv. Glavn. Bot. Sada SSSR 28: 638–654.

Jalas, J. & J. Suominen. Editors. 1980. Atlas Florae Europaeae. Distribution of vascular plants in Europe. Vol. 5. Helsinki.

Kitagawa, M. 1935. *Corispermum* in Manshuria & Korea. Pp. 99–105 *in:* Report of the First Scientific Expedition to Manchoukuo. Sect. 4, part 2. Tokyo.

Köck, U.-V. 1986. Verbreitung, Ausbreitungsgeschichte, Soziologie und Ökologie von *Corispermum leptopterum* (Aschers.) Iljin in der DDR. I. Verbreitung und Ausbreitungsgeschichte. Gleditschia 14: 305–325.

Lomonosova, M. N. 1992. *Corispermum* L. Pp. 166–171 *in:* I. M. Krasnoborov & L. I. Malyschev (editors), Flora Sibiri (Flora Sibiriae). Vol. 5 (Salicaceae–Amaranthaceae). Novosibirsk.

Lunell, J. 1910. New plants from North Dakota. Amer. Midl. Naturalist 1(8): 204–208.

Maihle, N. J. & W. H. Blackwell. 1978. A synopsis of North American *Corispermum* (Chenopodiaceae). Sida 7(4): 382–391.

Matthews, J. V. 1982. East Beringia during Late Wisconsin time: A review of the biotic evidence. Pp. 127–150 *in* D. M. Hopkins et al., Paleoecology of Beringia. Academic Press, London.

Mosyakin, S. L. 1988a. Pryrodno-vydova dyfferentsiatsiya rodu *Corispermum* L. na terytoriyi Ukrayiny. (The natural-specific differentiation of the genus *Corispermum* L. in Ukraine.) Ukrayins'k. Bot. Zhurn. 45(3): 37–40.

———. 1988b. Krytychnyy pereglyad vydiv rodu *Corispermum* L. flory Ukrayiny. (A critical revision of *Corispermum* species in Ukraine.) Ukrayins'k. Bot. Zhurn. 45(5): 19–23.

———. 1994. New infrageneric taxa of *Corispermum* L. (Chenopodiaceae). Novon 4: 153–154.

Nelson, A. 1909. Coulter's New Manual of Botany of the Central Rocky Mountains. Revised ed. American Book, Chicago.

Nuttall, T. 1818. The Genera of North American Plants, and a Catalogue of the Species to the Year 1817. Vol. 2. Philadelphia.

———. 1834. Collections toward a flora of Arkansas. Amer. Philos. Soc. Trans. 5: 139–203.

Pielou, E. C. 1991. After the Ice Age: The Return of Life to Glaciated North America. Univ. Chicago Press, Chicago & London.

Rafinesque, C. S. 1836. New Flora and Botany of North America. Part 4. Philadelphia.

Rosendahl, C. O. 1948. A contribution to the knowledge of the Pleistocene flora of Minnesota. Ecology 29: 284–315.

Rydberg, P. A. 1897. Rarities from Montana. I. Bull. Torrey Bot. Club. 24(4): 188–192.

———. 1903. Studies on the Rocky Mountain flora. X. Bull. Torrey Bot. Club. 30(4): 247–262.

———. 1904. Studies of the Rocky Mountain flora—XI. Bull. Torrey Bot. Club 31: 399–410.

Small, E. 1973. Xeromorphy in plants as a possible basis for migration between arid and nutritionally-deficient environments. Bot. Not. (Lund) 126: 534–539.

Steven, C. 1817. Observationes in Plantas Rossicas et descriptiones specierum novarum. Mém. Soc. Imp. Naturalistes Moscou 5: 334–338.

Strazdin'sh, Yu. G. 1985. Rod *Corispermum* L. Pp. 154–166 *in:* L. V. Tabaka & al. Flora i rastitel'nost' Latviyskoy SSR. Vostochno-Latviyskiy geobotanocheskiy rayon. (Flora and vegetation of the Latvian SSR. The Eastern Latvian geobotanic region). Zinatne, Riga.

Tsien Cho-po & Ma Cheng-gung. 1979. *Corispermum* L. Pp. 50–75 *in:* Flora Reipublicae Popularis Sinicae. Tomus 25(2). Beijing.

Uotila, P. 1993. Taxonomic and nomenclatural notes on *Chenopodium* in the Flora Iranica area. Ann. Bot. Fenn. 30(3): 189–194.

Voss, E. 1985. Michigan Flora. Part 2. Dicots (Saururaceae–Cornaceae). Ann Arbor, Michigan.

Young, S. B. 1982. The vegetation of Land-Bridge Beringia. Pp. 179–191 *in:* D. M. Hopkins et al., Paleoecology of Beringia. Academic Press, London.

## Note added in proof.

Since this article was submitted for publication, some additional isotypes and paratypes have been found in the herbaria at US and LE: *Corispermum pacificum: C. V. Piper 1770* (isotype, US); *W. N. Suksdorf 1385* (paratype, US); *C. pallidum: J. H. Sandberg & J. B. Leiberg 309* (isotype, LE); *C. hookeri: B. Boivin & G. F. Ledingham 14079* (isotype, LE); *C. ochotense* var. *alaskanum: L. J. Palmer 13* (paratype, US).

*Corispermum welshii* is now known from two additional states of the U.S.A.: **Arizona:** Coconino Co., Teetso Spring, sandy soil, 13 Nov. 1971, *N. D. Atwood & D. Kaneko 3420* (US); **New Mexico:** Thornton, 19 Oct. 1903, *D. Griffiths 6209* (US).

# A New Species of *Geonoma* (Arecaceae) from Panama

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ABSTRACT. *Geonoma mooreana* is described from wet forests on the Atlantic slope of western Panama.

Review of herbarium material for floristic and monographic projects involving Central American palms (Arecaceae) has revealed the following new Panamanian species of *Geonoma* (Arecoideae: Geonomeae).

**Geonoma mooreana** de Nevers & Grayum, sp. nov. TYPE: Panama. Veraguas: vicinity Santa Fe, along road between Santa Fe and Calovébora, 1.7 mi. past Alto Piedra School, 1.5 mi. beyond Quebrada Cosilla (previously referred to as Río Primero Braso), 8°33′N, 81°08′W, 570 m, 13 July 1994 (fruit), *Croat & Zhu 76826* (holotype, MO; isotypes, CAS, PMA).

Species cum *G. tenuissima* H. E. Moore optime congruens, sed differt foliis regulariter pinnatis pinnis angustis, inflorescentiis majoribus, labio infero fovearum floralium bifidoque.

Stems caespitose, with to at least 4 stems per plant, 2–3.5 m high, slender, to at least 1.7 cm diam. at nodes; leaves regularly pinnate; sheath 9–18+ cm; petiole 41–52 cm, broadly channeled adaxially, rounded abaxially; rachis 62–81 cm, occasionally terminating in a slender filament to at least 1.7 cm; pinnae 25–35(–51) per side, narrowly linear with one prominent raised vein adaxially, one prominent and two less prominent raised veins abaxially, 9–42 × 0.4–1.5(–3.1) cm, glabrous or essentially so; inflorescence infrafoliar, 2–4 nodes below current leaves, paniculate, branched to three orders, 24–32 × 18–38 cm; peduncle 6–17 cm; prophyll and peduncular bract inserted close together at base of peduncle; prophyll 11–15.5(–21) × 2.8–5.0 cm, slightly swollen in bud, obscurely striate; peduncular bract slightly smaller than prophyll, included in it; inflorescence rachis 6–20.5 cm, with 4–7 primary branches; rachillae ca. 110–165, reddish, 13–19 cm × 0.5–1 mm, sparsely to moderately setulose at anthesis (later glabrescent), drying rugose; floral pits spirally arranged, ca. 1–2 mm apart, the lips prominently exserted from the rachillae, the lower lip bifid, the orifice ca. 1 × 1 mm; staminate flowers ca. 3 mm, sepals and petals subequal, free, erect at anthesis, slightly imbricate below; stamens 6, filaments spreading, anthers sharply reflexed from the filaments; pistillate flowers ca. 2 mm, sepals and petals subequal, barely exserted, styles 3, reflexed, staminodial tube truncate; fruit oblong to globose, green, drying brown, 5–6 × 4–5 mm, surface minutely verrucose (pebbled); seed black, oblong, 4–5 mm; germination unknown. Figure 1.

*Geonoma mooreana* occurs in wet forests on the Atlantic slope of western Panama, at elevations of ca. 100–1000 m. It has been collected about 30 km from the Costa Rican border in Bocas del Toro Province. The apparent geographic discontinuity between the Bocas del Toro and Veraguas stations is probably spurious, as the area in question is one of the most poorly collected in Panama.

*Geonoma mooreana* is most similar phenetically to *G. scoparia* Grayum & de Nevers, *G. concinna* Burret, and *G. tenuissima* H. E. Moore. *Geonoma scoparia,* with which specimens representing *G. mooreana* were compared by Grayum and de Nevers (1988: 113), shares the highly branched, broomlike inflorescence and pebbled fruit, but differs in its consistently solitary habit, generally smaller dimensions, trijugate leaves, and crenate (vs. truncate) staminodial tube. *Geonoma concinna* has the truncate staminodial tube and pebbled fruits of *G. mooreana,* but differs in its consistently trijugate leaves, much smaller inflorescence bracts, and fewer, thicker rachillae. The inflorescence of *G. mooreana* also resembles that of *G. tenuissima* of Ecuador, which differs in its simple leaf blades, shorter, more delicate inflorescence rachillae, and floral pits with the lower lip entire rather than bifid.

Several collections of *Geonoma mooreana* bear incomplete or partial inflorescences. Bulky palm inflorescences usually must be pruned for pressing, and the severed branches are often used to make

Figure 1. *Geonoma mooreana* de Nevers & Grayum (A [except fruits], *Nee 11252*; B, *Hammel 3459*; A [fruits], C, *Kirkbride & Duke 649*). —A. Section of stem with leaf base and inflorescence (many rachillae removed for clarity) (×0.50). —B. Medial portion of leaf (×0.75). —C. Section of infructescence rachilla with fruits (×1.75).

duplicate specimens. Thus, the PMA and CAS isotypes of *G. mooreana* include the main basal and suprabasal branches (respectively) that are missing from the holotype infructescence. Isolated branches may easily be mistaken for entire inflorescences or infructescences in the herbarium, yielding substantially false impressions of such attributes as peduncle length, overall inflorescence size, and the number of rachillae.

The specific epithet commemorates the late Harold E. Moore, Jr. (1917–1980), leading palm authority of his generation, who realized this was a new species and annotated two of the paratypes (*Hammel 3459* and *Nee 11252*) as "*Geonoma* sp. nov."

*Paratypes.* PANAMA. **Bocas del Toro:** between Q. Lugron and Cerro Bonyic, nr. Río Teribe, 90–270 m, 13 Apr. 1968 (fruit), *Kirkbride & Duke 649* (MO, NY). **Coclé:** Atlantic slope along Río San Juan above its fork with Río Tife, ca. 1200 ft., 12 June 1978 (fruit), *Hammel 3459* (MO). **Veraguas:** Caribbean slope above Río Primero Brazo 5 mi. NW of Santa Fe, 700–1200 m, 18–19 Mar. 1973 (flower), *Croat 23120* (MO 2 sheets); along road between Escuela Agrícola and Alto Piedra (above Santa Fe) and Río Dos Bocas ca. 5–8 km from Escuela, 730–770 m, 26 July 1974 (bud), *Croat 25931* (MO); rd. from Santa Fe to Calovébora, creek about 5 km beyond Escuela Agrícola, ca. 500 m, 8°40′N, 81°5′W, 1 Mar. 1995 (past fruiting), *de Nevers et al. 10601* (CAS); lower montane wet forest 7 km W of Santa Fe on new road past agricultural school, ca. 2900 ft., 12 Apr. 1974 (flower/young fruit), *Nee 11252* (MO).

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Literature Cited

Grayum, M. H. & G. C. de Nevers. 1988. New and rare understory palms from the Península de Osa, Costa Rica, and adjacent regions. Principes 32: 101–114.

# Nomenclatural Notes on the Myrsinaceae of China

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ABSTRACT. The following nomenclatural changes are proposed: *Maesa brevipaniculata* (C. Y. Wu & C. Chen) Pipoly & C. Chen, *M. confusa* (C. M. Hu) Pipoly & C. Chen, *Embelia laeta* (L.) Mez subsp. *papilligera* (Nakai) Pipoly & C. Chen, *E. ribes* Burman f. subsp. *pachyphylla* (C. Y. Wu & C. Chen) Pipoly & C. Chen, *Ardisia obtusa* Mez subsp. *pachyphylla* (Dunn) Pipoly & C. Chen, *Myrsine cicatricosa* (C. Chen) Pipoly & C. Chen, *M. verruculosa* (C. Chen) Pipoly & C. Chen, *M. faberi* (Mez) Pipoly & C. Chen, and *M. kwangsiensis* (E. H. Walker) Pipoly & C. Chen. Twenty-three taxa in *Embelia* and *Ardisia* are reduced to synonymy for the first time. Twelve names in *Embelia*, *Ardisia*, and *Myrsine* are lectotypified.

In order to make the names available for the forthcoming treatment of Myrsinaceae for the *Flora of China*, the following nomenclatural changes in the genera *Maesa*, *Embelia*, *Ardisia*, and *Myrsine* (including *Rapanea*) are herein proposed. The authors have studied type or authentic material from China, the Pacific, and eastern Malesia and are broadening species concepts based on those studies. Type specimens seen from KUN have the acronym HY marked on them.

## *MAESA* FORSSKÅL

*Maesa* is the only genus in the Myrsinaceae with a semi-inferior to inferior ovary and a berrylike fruit. This paleotropical genus contains nearly 200 species, of which 28 are known from China.

**Maesa brevipaniculata** (C. Y. Wu & C. Chen) Pipoly & C. Chen, comb. nov. Basionym: *Maesa parvifolia* A. DC. var. *brevipaniculata* C. Y. Wu & C. Chen, Fl. Yunnan. 1: 324. 1977. TYPE: China. Yunnan: Malipo, 26 Aug. 1962, *K. M. Feng 22805* (holotype, KUN).

*Maesa brevipaniculata* is distinguished from *M. parvifolia* by having a velutinous brown tomentum, instead of a brown hirtellous-tomentose and rufous glandular-granulose tomentum on the branchlets, petioles, and inflorescence rachises. Therefore, it is more consistent to recognize *M. brevipaniculata* as a distinct species.

**Maesa confusa** (C. M. Hu) Pipoly & C. Chen, comb. nov. Basionym: *Maesa consanguinea* Merrill var. *confusa* C. M. Hu, Bot. J. South China 1: 12. 1992. TYPE: China. Hainan: Bao-ting Xian, Tong-za Mao-an, 23 Feb. 1957, *L. Tang 3789* (holotype, IBSC).

*Maesa confusa* is a poorly known taxon, but its densely and minutely glandular-granulose inflorescence rachises, long pedicels, highly angulate branchlets, and densely black punctate-lineate fruits readily separate it from *M. consanguinea*.

## *EMBELIA* BURMAN F.

*Embelia* contains approximately 150 species of lianas (at maturity) that are distributed in the Paleotropics from southern China to Malesia, west through Indochina to India, and on to Madagascar and continental tropical Africa. *Embelia* is a member of the tribe Myrsineae and is the sister genus of *Cybianthus* Martius (Pipoly, 1987). It is the only lianous member of the family and is distinguished by its plagiotropic branches and free petals and stamens. Walker (1940) recognized 18 species in China, of which 12, as well as 2 additional species hitherto unknown in China, are recognized by the authors.

**Embelia pauciflora** Diels, Bot. Jahrb. 29: 517. 1900. TYPE: China. Sichuan: Nanchuan, *Bock & von Rosthorn 25* (holotype, B presumed destroyed; fragment, US).

*Embelia blinii* H. Léveillé, Repert. Spec. Nov. Regni Veg. 10: 375. 1912. Syn. nov. TYPE: China. Guizhou: near Mt. College, to Kematong, Feb. 1898 (pistillate fl), *J. Chattanjon & E. Bodinier 2081* (holotype, E; isotypes, A, P).

*Embelia dielsii* H. Léveillé, Repert. Spec. Nov. Regni Veg. 10: 374. 1912. Syn. nov. TYPE: China. Guizhou: Pin-Fa, 17 Feb. 1903 (staminate fl), *J. Cavalerie* (holotype, E; isotypes, A, P).

*Embelia kaopoensis* H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 186. 1913. Syn. nov. TYPE: China. Guizhou: Kao-Po, 15 Dec. 1911 (pistillate fl, fr), *E. Bodinier s.n.* (holotype, E).

*Embelia pauciflora* apparently exhibits extreme local variation in its precocious staminate flowering, which causes abrupt quantitative variation for those plants bearing essentially "juvenile" leaves. Differences among the populations represented by the type specimens of *Embelia blinii, E. dielsii, E. kaopoensis,* and *E. schlechteri* are entirely quantitative and represent at best localized variation.

**Embelia laeta** (L.) Mez in Engler, Pflanzenr. 9(IV. 236): 326. 1902.

*Embelia laeta* is readily recognized from the other members of *Embelia* by the minute emargination at the leaf apex and gray to reddish bark. It consists of two subspecies, of which subspecies *papilligera* is distributed in China (Guangdong, Jiangxi, Taiwan) and Japan, whereas subspecies *laeta* is distributed in China (Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Taiwan, Yunnan), Cambodia, Laos, Thailand, and Vietnam. It appears that subspecies *papilligera* grows in somewhat more humid habitats than subspecies *laeta.* The two subspecies may be easily distinguished by the following key.

1a. Branchlets straight to somewhat flexuous, glabrous; leaves chartaceous, margins flat; pedicels and calyx glabrous; petals glandular-ciliate along the margin . . . . . subsp. *laeta*

1b. Branchlets geniculate, minutely and densely rufous glandular papillose-tomentose; leaves coriaceous, margins revolute; pedicels and calyx glandular-puberulent; petals glabrous along the margin . . . . . subsp. *papilligera*

**Embelia laeta** (L.) Mez subsp. **papilligera** (Nakai) Pipoly & C. Chen, stat. nov. Basionym: *Samara laeta* var. *papilligera* Nakai in Nakai & Honda, Nov. Fl. Japan 9: 24. 1943. TYPE: Japan. Mt. Arisan, between Heishana & Nimandaira, to 7000 ft. alt., Apr. 1914 (fl, fr), *Hayata s.n.* (holotype, TI).

**Embelia parviflora** Wallich ex A. de Candolle, Trans. Linn. Soc. 17: 130. 1834. TYPE: India. Assam: *Wallich 2307* (holotype, K-W).

*Embelia pulchella* Mez in Engler, Pflanzenr. 9(IV. 236): 324. 1902. Syn. nov. SYNTYPES: India. Assam: *Griffith s.n.* (B destroyed, K); Manipur: *Watt 7277* (lectotype, here designated, K).

*Embelia myrtifolia* Hemsley & Mez, Notizbl. Bot. Gart. Berlin 3: 107. 1901. SYNTYPES: China. Yunnan: Mentze, S mountains, (pist. fl), *A. Henry 12826*; China. Yunnan: Mentze, S mountains, (stam. and pist. fls), *A. Henry 9384* (lectotype, here designated, A; isolectotypes, MO, US (pist. fl)).

**Embelia ribes** Burman f., Fl. Ind. 62. pl. 23. 1768.

As a result of a detailed study of *Embelia ribes* throughout its geographic range, it became apparent that two distinct entities exist. One grows in forests on well-drained soils, while the other is restricted to water-logged habitats. These are recognized as subspecies that can be distinguished as follows:

1a. Branchlets lenticellate; leaf blade chartaceous, sordid adaxially; floral bracts subulate; petals erect in anthesis; stamens and staminodes equal in size, subequaling petals; anthers longer than wide; fruit 3–4(–5) mm diam. when dried; plants of forests, on well-drained sands or sandy loams . . . . . subsp. *ribes*

1b. Branchlets without lenticels; leaf blade coriaceous to cartilaginous, nitid adaxially; floral bracts lanceolate; petals highly reflexed in anthesis; stamens slightly exserted ca. 1 mm in anthesis, staminodes ca. ⅔ petal length; anthers wider than long; fruit 2–3 mm diam. when dried; plants of poorly drained clay areas, swamps, and forests . . . . . subsp. *pachyphylla*

*Embelia ribes* subsp. *ribes* is distributed in China (Fujian, Guangdong, Guangxi, Guizhou, Hainan, Xizang, and Yunnan), Sri Lanka, India, Myanmar, Laos, Thailand, Cambodia, Vietnam, Malaysia, Sumatra, Java, and Kalimantan.

**Embelia ribes** Burman f. subsp. **pachyphylla** (C. Y. Wu & C. Chen) Pipoly & C. Chen, stat. nov. Basionym: *Embelia ribes* var. *pachyphylla* Chun ex C. Y. Wu & C. Chen, Fl. Yunnan. 1: 364. 1977. TYPE: China. Guangdong: Lechang Xian, *Zuo Jing-lie 20451* (holotype, KUN).

*Embelia tenuis* Mez in Engler, Pflanzenr. 9(IV. 236): 314. 1902. Syn. nov. TYPE: Malaysia. Sarawak: *Hullet 271* (holotype, K).

Subspecies *pachyphylla* is distributed in China (Guangdong, Guangxi, Hainan, Yunnan), Sarawak, Sumatra, and Vietnam.

**Embelia vestita** Roxburgh, Fl. Ind. ed. Carey 2: 288. 1824.

*Embelia prunifolia* Mez in Engler, Pflanzenr. IV (236): 316. 1902. SYNTYPES: China. Yunnan: Mentze, 1700–2000 m, (stam. fl), *A. Henry 9380C* (B destroyed, A); *10260* (B destroyed, A), *11327A, 11327B* (B destroyed, A); China. Yunnan: 5500′, *A. Henry 9380* (lectotype, here designated, A; isolectotype, B destroyed).

*Embelia oblongifolia* Hemsley, J. Linn. Soc., Bot. 26: 62. 1882. Syn. nov. TYPE: China. Guangdong: Lofaushan, *Ford 90* (holotype, K).

*Embelia bodinieri* H. Léveillé, Repert. Spec. Nov. Regni Veg. 9: 327. 1911. Syn. nov. TYPE: China. Guizhou: *J. Esquirol 743* (holotype, E; isotype, P).

*Embelia rudis* Handel-Mazzetti, Anz. Akad. Wiss. Wien. Math.-Nat. 59: 108. 1922. Syn. nov. TYPE: China. Jiangxi: *Handel-Mazzetti 157* (holotype, W).

*Embelia nigroviridis* C. Chen, Acta Phytotax. Sin. 16(3): 81. 1978. Syn. nov. TYPE: China. Xizang: Cha-yu, *Tsinghai-Tibet Expedition 73–678* (holotype, HP).

*Embelia vestita* is here treated as a polymorphic, broad-ranging species with numerous locally variable populations. It grows in mixed forests, evergreen, broad-leaved forests, shrubby areas, and limestone hillsides in China (Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang), India, Myanmar, Nepal, and Vietnam.

The type of *Embelia rudis* represents populations whose tertiary veins are extremely thick and whose adaxial leaf surface is more nitid than the type of *E. vestita*. The type of *Embelia oblongifolia* represents populations with remotely serrate leaves and fewer, coarse secondary veins than those of the type of *E. rudis*. The variation noted above precluded segregation of even infraspecific groupings. Therefore, the species is treated as a polymorphic ochlospecies (sensu White, 1962; Prance, 1972, 1982; Pipoly, 1983). The highly nitid leaf blades and inconspicuously pellucid or brown punctate sepals easily separate *E. vestita* from *E. undulata* and *E. scandens*, the most closely related congeners.

## Ardisia Swartz

*Ardisia* is a pantropical genus of about 500 species, including many as yet undescribed from Vietnam, Sabah, Sarawak, Sulawesi, New Caledonia, Madagascar, Colombia, Ecuador, and Peru. It is represented in China by 64 species, most of which are members of subgenus *Crispardisia*.

**Ardisia obtusa** Mez in Engler, Pflanzenr. 9(IV. 236): 104. 1907. TYPE: China. Hainan: *Henry 7990* (holotype, B destroyed; photo and fragment, US).

*Ardisia obtusa* is a member of subgenus *Akosmos* Mez, which includes about 50 species and has its centers of diversity in Borneo, Celebes, and Moluccas. It is represented in China by two subspecies: subspecies *obtusa* is endemic to China (Guangdong and Hainan) and grows in thickets, broad-leaf forests, hilly areas, and along creek margins; subspecies *pachyphylla* grows in dense evergreen broad-leaf forests, steep valley slopes, and in places with poor drainage in China (Guangxi, Hainan) and Vietnam. The two subspecies can be separated as follows:

1a. Leaves oblanceolate to obovate; petioles broadly marginate, 1.2–1.5 cm long; sepals 1.2–1.5 mm long; petals 3–6 mm long, inconspicuously pellucid punctate; 0–100 m, lowland forests . . . subsp. *obtusa*

1b. Leaves narrowly oblanceolate or linear-lanceolate; petioles marginate and canaliculate, 0.6–1 cm long; sepals 0.8–1 mm long; petals 2–2.5 mm long, densely and minutely orange punctate, 400–700 m, montane forests . . . . . .subsp. *pachyphylla*

**Ardisia obtusa** Mez subsp. **pachyphylla** (Dunn) Pipoly & C. Chen, comb. et stat. nov. Basionym: *Ardisia pachyphylla* Dunn, Bull. Misc. Inform. 1912: 368. 1912. TYPE: China. Hainan: Five Finger Mountains, *Katsumata s.n.* (*HK No. 6680*) (holotype, HK; photo and fragment, A, K).

*Ardisia graciliflora* Pitard in Lecomte, Fl. Gen. Indo-Chine 3: 832. 1930. Syn. nov. TYPE: [Vietnam]. Annam: Phu-Hu, prov. Nhatrang, 19 Jan. 1923 (fl), *E. Poilane 1362* (holotype, P; isotypes, A 2 sheets).

*Ardisia graciliflora* differs from subspecies *pachyphylla* by a combination of largely quantitative characters, and it is considered to be a diminutive form of subspecies *pachyphylla*, perhaps a juvenile flowering precociously.

Our study of specimens most commonly referred to *Ardisia yunnanensis* Mez has revealed that the earliest name for the taxon is *Ardisia thyrsiflora* D. Don. Quantitative differences in leaf length and number of flowers per corymb has caused taxonomic confusion. This species, as now interpreted, is most closely related to *A. amherstiana* A. DC., a taxon most frequently encountered in Vietnam. The revised synonymy follows.

**Ardisia thyrsiflora** D. Don, Prodr. Fl. Nep. 148. 1825. TYPE: Nepal, *Wallich s.n.* (BM).

*Ardisia tenera* Mez in Engler, Pflanzenr. 9(IV. 236): 104. 1902. Syn. nov. SYNTYPES: China. Yunnan: Szemao, 1500 m, *A. Henry 12123A* (B destroyed, A); China. Yunnan: Szemao, 1500 m, *A. Henry 12094* (holotype, B destroyed; lectotype, here designated, A; isolectotypes, MO, US).

*Ardisia yunnanensis* Mez in Engler, Pflanzenr. 9(IV. 236): 107. 1902. Syn. nov. TYPE: China. Yunnan: Szemao, 5000′, tree 30′, fls. white, *A. Henry 13095* (holotype, B destroyed; lectotype, here designated, A; isolectotypes, MO, NY, US).

*Ardisia penduliflora* Mez in Engler, Pflanzenr. IV(9). 236: 150. 1902. Syn. nov. SYNTYPES: China. Hubei: 1885–1888 (fl), *A. Henry 4314* (B destroyed); China. Hubei: 1885–1888 (fl), *A. Henry 6365* (lectotype, here designated, US).

*Ardisia undulata* Mez in Engler, Pflanzenr. 9(IV. 236): 146. 1902. Syn. nov. TYPE: China. Yunnan: Mephra, 1700 m, *A. Henry 10779* (holotype, B destroyed; lectotype, here designated, A; isolectotypes, MO, US). Later homonym, not C. B. Clarke (1882).

*Ardisia thyrsiflora* grows on woody hills and in broad-leaf forests, valleys, and damp places in China (Guangxi, Hainan, Xizang, Yunnan), India, Myanmar, Nepal, and Vietnam. It is a highly variable species closely related to *A. amherstaiana* A. DC., *A. waitakii* C. M. Hu, *A. baotingensis* C. M. Hu, and *A. quinquegona* Blume. These four taxa, along with *Ardisia fordii* Hemsley, a diminutive plant, form a natural group within subgenus *Akosmos*. The separation of these taxa in the flora is at best artificial, and further studies are needed to resolve the limits in this complex.

**Ardisia corymbifera** Mez in Engler, Pflanzenr. 9(IV. 236): 149. 1902. SYNTYPES: China. Yunnan: Simao, 1250 m, (fl), *A. Henry 11724* (B destroyed); China. Yunnan: Simao, (fl), *A. Henry 12,000A* (holotype, B destroyed; lectotype, here designated, A; isolectotype, MO).

*Ardisia corymbifera* Mez var. *tuberifera* C. Chen, Acta Phytotax. Sin. 16(3): 80. 1978. Syn. nov. TYPE: China. Guangxi: Lung Chow, *S. Chun 13096* (holotype, HK).

*Ardisia maculosa* Mez in Engler, Pflanzenr. 9(IV. 236): 146. 1902. Syn. nov. SYNTYPES: China. Yunnan: Szemao, 6000 ft. elev. (fl, fr), *A. Henry 12088D* (B destroyed); China. Yunnan: Szemao, shrub 8′, fls. pink, fr. red. (fl, fr), *A. Henry 12088E* (holotype, B destroyed; lectotype, here designated, US 458840; isolectotypes, A 00025251, 00025252; MO 126457, 126458). NOTE: Herbarium accession numbers are included here because many sheets contain two accession numbers with two specimens, one of which may not have been cited in the protologue.

*Ardisia radians* Hemsley & Mez in Engler, Pflanzenr. 9(IV. 236): 146. 1902. Syn. nov. *Blahdia radians* (Hemsley & Mez) Masamune, Short Pl. Form. 162. 1936. SYNTYPES: China. Yunnan: Szemao, 4500 ft. elev., *A. Henry 535, 9226A* (B destroyed, K); China. Yunnan: Szemao, 4500 ft. elev., shrub 8′, fls white (fl), *A. Henry 11624C* (lectotype, here designated, K; isolectotypes, A, B destroyed, MO).

*Ardisia patens* Mez in Engler, Pflanzenr. 9(IV. 236): 149. 1902. Syn. nov. TYPE: China. Yunnan: Szemao, 5000 ft. elev., shrub 3′, fr. red (fr), *A. Henry 12088B* (holotype, B destroyed; lectotype, here designated, MO; isolectotype, A).

*Ardisia tonkinensis* A. DC., Repert. Spec. Nov. Regni Veg. 8: 354. 1910. Syn. nov. SYNTYPES: Vietnam. Tonkin: Kien-Kihé, in fields of Dong Ham & Dong Bau, *H. Bon 2142, 2541, 2912* (G, P); Vo-Xa, on Mt. Chuir-Hac, *H. Bon 2902* (G, P). Lectotypification of this binomial will be made after further study of all duplicates.

*Ardisia rectangularis* Hyata, J. Coll. Sci. Univ. Tokyo 30: 182. 1911. Syn. nov. SYNTYPES: Japan. Shintiku: Gozhizann, June 1906, *T. Kawakwmi & U. Mori 1435* (TI); Kusshaku, 1905, *S. Nagasawa 358* (TI); Taito: Murimurisha, Dec. 1899, *K. Miyake s.n.* (TI). This binomial will be lectotypified when all duplicates of the collections cited in the protologue are examined.

*Ardisia stellifera* Pitard, Fl. Indo-Chine 3: 863. 1930. Syn. nov. TYPE: [Vietnam]. Annam: Thua-tien, Thuy-cam, *Eberhardt s.n.* (holotype, P; fragment, A).

*Ardisia virens* Kurz var. *annamensis* Pitard, Fl. Indo-Chine 3: 868. 1930. Syn. nov. TYPE: [Vietnam]. Annam: Quang-tri: Dent du Tigre, 800 m, *Poilane s.n.* (holotype, P; fragment, A).

*Ardisia maculosa* Mez var. *symplocifolia* C. Chen, Act. Phytotax. Sin. 16(3): 79. 1978. Syn. nov. TYPE: China. Yunnan: Hokao, *S. Hsuan 610078* (holotype, KUN).

*Ardisia virens* is closely related to *A. elegantissima* H. Léveillé. The separation of the two is based on the presence or absence of papillae on the inflorescence rachises and branchlets. *Ardisia virens* grows in dense evergreen broad-leaf forests, hillsides, dark damp places, humus-rich soils in China (Guangxi, Guizhou, Hainan, Taiwan, Yunnan), India, Myanmar, Thailand, Vietnam, Kalimantan, Brunei, and Sabah.

*MYRSINE* L.

As here delimited, *Myrsine* L. (including *Rapanea* Aublet) is a pantropical genus of about 300 species, of which 11 grow in China. Recent studies of tropical American taxa (Pipoly, 1991, 1992a, b, c) have shown that many taxa have staminate flowers with anthers on filaments, while the pistillate flowers have the filaments reduced or barely detectable. Pipoly (1992a) provided a complete rationale for including *Rapanea* as a synonym of *Myrsine*. Our treatment of *Myrsine* to include species formerly placed in *Rapanea* requires several new combinations.

**Myrsine cicatricosa** (C. Chen) Pipoly & C. Chen, comb. nov. Basionym: *Rapanea cicatricosa* C. Y. Wu & C. Chen ex C. Chen, Fl. Yunnan. 1: 381. 1977. TYPE: China. Vietnam, Shaba, Huanglianshan, *Sino-Vietnamese Expedition 55* (holotype, KUN).

**Myrsine verruculosa** (C. Chen) Pipoly & C. Chen, comb. nov. Basionym: *Rapanea verruculosa* C. Y. Wu ex C. Chen, Fl. Yunnan. 1: 380. 1977. TYPE: China. Yunnan: Xichou Xian, 26 Sep. 1947, *K. M. Feng 12062* (holotype, KUN).

**Myrsine faberi** (Mez) Pipoly & C. Chen, comb. nov. Basionym: *Rapanea faberi* Mez in Engler, Pflanzenr. 9(IV. 236): 358. 1902. SYNTYPES: China. Yunnan: Mentze, 2000 m, *A. Henry 9173A* (B destroyed, W); China. Guangdong: *Faber 132* (B destroyed; lectotype, here designated, US; isolectotype, W).

**Myrsine kwangsiensis** (E. H. Walker) Pipoly & C. Chen, comb. nov. Basionym: *Rapanea kwangsiensis* E. H. Walker, J. Wash. Acad. Sci. 21: 479. 1931. TYPE: China. Guangxi: Lanlow, E Linyen, *Ching 6657* (holotype, US; isotype, A).

*Rapanea kwangsiensis* E. H. Walker var. *lanceolata* C. Y. Wu & C. Chen, Fl. Yunnan. 1: 383. 1977. Syn. nov. TYPE: China. Yunnan: Jinping Xian, 8 Jan. 1933, *H. T. Tsai 52550* (holotype, KUN).

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Literature Cited

Pipoly, J. 1983. Contributions toward a monograph of *Cybianthus* (Myrsinaceae): III. A revision of subgenus *Laxiflorus*. Brittonia 35: 61–80.

———. 1987. A systematic revision of the genus *Cybianthus* subgenus *Grammadenia* (Myrsinaceae). Mem. New York Bot. Gard. 43: 1–76.

———. 1991. Systematic studies in the genus *Myrsine* L. (Myrsinaceae) in Guayana. Novon 1: 204–210.

———. 1992a. A further note on *Myrsine perpauciflora* Pipoly (Myrsinaceae). Novon 2: 176.

———. 1992b. Estudios en el género *Myrsine* (Myrsinaceae) de Colombia. Caldasia 17(1): 3–9.

———. 1992c. Notes on the genus *Myrsine* (Myrsinaceae) in Peru. Novon 2: 392–407.

Prance, G. 1972. Chrysobalanaceae. Flora Neotropica 9: 1–410.

———. 1982. Forest refuges: Evidence from woody angiosperms. Pp. 137–156 *in* G. Prance (editor), Biological Diversification in the Tropics. Columbia Univ. Press, New York.

Walker, E. H. 1940. A revision of the Eastern Asiatic Myrsinaceae. Philipp. J. Sci. 73: 1–258.

White, F. 1962. Geographic variation and speciation in Africa with particular reference to *Diospyros*. Pp. 71–103 *in* D. Nichols (editor), Taxonomy and Geography. The Systematics Association Publ. No. 4, London.

# New Andean *Zanthoxylum* (Rutaceae) with Distinctive Vegetative Characters

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ABSTRACT. Three new Andean species of *Zanthoxylum* (= *Fagara*), *Z. gentryi* Reynel, *Z. lenticulare* Reynel, and *Z. lepidopteriphilum* Reynel, are described and illustrated. Vegetative characters of taxonomic and practical identification value are briefly discussed. Some of these features relate to insect–plant interactions.

RESUMEN. Tres nuevas especies de *Zanthoxylum* (= *Fagara*), *Z. gentryi* Reynel, *Z. lenticulare* Reynel y *Z. lepidopteriphilum* Reynel, son descritas e ilustradas. Se discuten brevemente caracteres vegetativos de utilidad taxonómica y práctica en la identificación de especies en el género. Algunos de estos caracteres tienen relación con interacciones insecto-planta.

The mainly pantropical and subtropical genus *Zanthoxylum* L. s.l. comprises about 200 woody species, mostly trees. Engler (1874, 1896, 1931) regarded *Zanthoxylum* s. str. as separate from *Fagara* L. and proposed a sectional and subsectional scheme for the latter. Waterman (1975a, 1976) combined the two genera and transferred the species from *Fagara* to *Zanthoxylum* s.l.; evidence has accumulated in recent years supporting that unification, on the grounds of floral morphology (Brizicky, 1962; Hartley, 1966; Beurton, 1994), floral anatomy (Yamazaki, 1988), wood anatomy (Reynel & Miller, in prep.), and phytochemistry (summarized in Waterman, 1975b, 1977, 1983).

In this paper I describe three new Andean species of *Zanthoxylum* that have distinctive vegetative features: interspaced, short zones of clustered leaf and bud-scale scars (*Z. gentryi*, Fig. 1A, 2B); hollow myrmecophilous apical branchlets (*Z. lenticulare*, Fig. 1B); and twice-revolute basal leaflet margins (*Z. lepidopteriphilum*, Fig. 2A, 2C). These new species belong to the group of New World species with 5-merous, differentiated perianths placed in *Fagara* subsection Paniculatae–Neogaeae by Engler (1896).

**Zanthoxylum gentryi** Reynel, sp. nov. TYPE: Colombia. Valle: Municipio Restrepo, Vereda de Riogrande, abajo del puente, en predios de la familia Reyna, en la vía Pavas-Restrepo, 1200 m, 10 Feb. 1990 (fr), *J. Ramos & C. Reyna 2551* (holotype, MO; isotype, CUVC). Figure 1A, 2B.

Haec species *Z. petiolari* A. St.-Hilaire & Tulasne affinis, sed ab eo foliis 15–45 cm longis, interjugis 3.5–9 cm longis, foliolis lateralibus ovatis vel oblongis, sessilibus, (5–)7–17 cm longis, marginibus integris, panicula ampla, 7–20 × 6–16 cm (infructescentia usque ad 25 × 35 cm); petalis 2.6–3.5 mm longis, coccis 4–7 mm longis et seminibus 4–6 mm longis differt.

Dioecious treelets or trees to 10 m tall; apical branchlets 5–10 mm thick, with interspaced, short zones of clustered leaf and bud-scale scars, also with sparse, straight to incurved, compressed-conical spines to 6 mm long and sparse lenticels to 1 mm long, the branchlets covered with occasional white simple hairs to 0.1 mm long, the periderm usually peeling when dry. *Leaves* paripinnate or imparipinnate, 4–7(–9)-foliolate, 15–45 cm long, the terminal leaflet in imparipinnate leaves promptly deciduous; petiole 4–13 cm long; rachis terete, 2–3 mm thick, glabrescent, the interjuga 3.5–9 cm long, sometimes with an abaxial spine to 5 mm long; leaflets chartaceous, rigid, usually drying olive green and shiny on both sides, laterals opposite, sessile, terminal leaflet with petiolule 0–3 cm long, ultimate pair usually larger than rest, all leaflets ovate to oblong, (5–)7–17 × 3.5–9.5 cm, the apex acuminate, with acumen to 10 × 6 mm, base acute to obtuse or truncate; margin entire or subentire; leaflets glabrescent; midvein adaxially prominulous, secondary veins 10–16 pairs, prominulous on both sides, tertiary veins subreticulate. *Inflorescences* terminal or subterminal, multiflorous panicles 7–20 × 6–16 cm (–25 × 35 cm in fruit), branched 3–4 times; main axis 2–3 mm thick (–4 mm in fruit), secondary axes to 3–5 cm long (–20 cm in fruit), mostly forming a 60°–90° angle with main axis, the inflorescence axes covered with white, sparse simple hairs to 0.1 mm long; inflorescence bracts ovate to deltoid, 0.6–1(–3) × 0.7–1.2(–2) mm, glabrescent. *Flowers* 5-merous; floral bracts 1–3 at base of pedicel, deltoid to ovate, 0.6–1 × 0.5–1 mm, covered with indument similar to inflorescence axes or glabrescent; pedicel 0–1 × 1.2–2 mm (–4 mm long in fruit); calyx 0.5–1.4 × 1–3 mm, sepals free or connate to ½ their total length, ovate to deltoid, 0.8–1.2 mm broad, acute, glabrescent; petals saccate, ovate, 2.6–3.5 × 1.2–

Figure 1. —A. *Zanthoxylum gentryi* Reynel, apical branchlet with leaf and inflorescence (*Ramos 2334*). —B. *Zanthoxylum lenticulare* Reynel, apical branchlet with leaf and infructescence (*Soejarto et al. 4058*).

1.4 mm, the apex rounded to acute, strongly inflexed, usually with an ellipsoid resin gland to 0.2 mm diam., the petals glabrous. *Staminate flowers* with 5 stamens, exserted ⅓–½ their total length; filaments slender, 2.8–4 mm long, anthers 1.2–1.8 mm long, thecae oblong, the connective with an apical ellipsoid gland 0.2–0.3 mm long; nectary discoid to conical-truncate, 5-lobate, 0.4–0.5 × 1–1.3 mm; pistillodes 1–3, distinct to totally connate, elongate-pyriform, 0.7–1.5 × 0.2–0.5 mm. *Pistil-*

*late flowers* with 0–5 staminodes, membranous, ovate to oblong; gynophore conical, 1.2–1.8 × 0.7–1.6 mm; carpels 3–5, free except in the common stigma, ovaries obovoid, 0.5–0.8 × 1–1.5 mm, styles attached at adaxial upper half of ovaries, to 0.2 × 0.2 mm, stigma discoid, 3–5-lobed, 1.8–2.1 mm diam., 0.2–0.4 mm thick. *Fruit* apocarpous, (2–)3–4(–5)-follicular, frequently 1–3 follicles aborting; follicles subovoid, slightly laterally compressed, 4–7 mm long, glabrescent; seed ellipsoid to subreniform, 4–6 × 2.5–5 mm, the funicular scar rounded, 1.5–2 × 0.8–1.2 mm.

*Distribution.* Endemic to the Department of Valle in Colombia, at 600–1100 m, in wet primary or secondary forests.

Within neotropical species of *Zanthoxylum* with differentiated perianths, the presence of interspaced, short zones of clustered leaf and bud-scale scars on apical branchlets (Fig. 2B) is characteristic of a small group: *Z. petiolare* A. St. Hilaire & Tulasne (syn. *Z. naranjillo* Grisebach), a common species from southern Brazil, Bolivia, Argentina, and Paraguay; *Z. pentandrum* (Aublet) R. A. Howard (syn. *Z. hermaphroditum* Willdenow) from northern Brazil, Venezuela, and the Guianas; *Z. verrucosum* (Cuatrecasas) P. G. Waterman from Colombia; and *Z. pucro* from Panama. *Zanthoxylum gentryi* can be distinguished from the species of the *Zanthoxylum petiolare* group by the following key:

KEY TO SPECIES IN THE *ZANTHOXYLUM PETIOLARE* GROUP

1a. Leaves with lateral leaflets sessile . . . . . *Z. gentryi*
1b. Leaves with lateral leaflets petiolulate, petiolules 2–10 mm long.
  2a. Interjuga 5–12 cm long; leaflets 12–22 cm long.
    3a. Leaves imparipinnate, with ovate leaflets; inflorescence axes glabrous; pistillate flowers with petals 3–3.5 mm long; follicles 5–6 mm long . . . . *Z. verrucosum*
    3b. Leaves paripinnate, with oblong leaflets; inflorescence axes densely and finely pubescent; pistillate flowers with petals 1.7–2.4 mm long; follicles 6–9 mm long . . . . . *Z. pucro*
  2b. Interjuga 1.5–5 cm long; leaflets 3–12(–16) cm long.
    4a. Petals 1.3–1.7 mm long; anthers 0.4–0.6 mm long . . . . . *Z. pentandrum*
    4b. Petals 1.9–2.2 mm long; anthers 0.9–1.1 mm long . . . . . *Z. petiolare*

The new species is named after Alwyn H. Gentry (1947–1993), botanist and ecologist, whose work and knowledge of the Andean–Amazonian flora and its diversity inspired a generation of tropical biologists.

*Paratypes.* COLOMBIA. **Valle:** Municipio Toro, quebrada San Lazaro (fr), *Devia 328* (MO, TULV); near Yotoco, N of Cali, 3°45′N, 76°30′W, *Gentry et al. 54073* (COL, MO); El Silencio, Hacienda Himalaya, W of Yumbo, 3°50′N, 76°40′W (fr), *Gentry et al. 65516* (COL, MO); Finca El Espinal, 25 km N of Cali (fr), *Hughes 129* (FHO, MO); Dagua Valley, 15.5 km below Dagua and 1.5 km below Lobo Guerrero, quebrada de la Chapa, upper end El Boquerón of río Dagua (fl), *Hutchinson et al. 3102* (COL, F, G, K, MO, NY, UC, US); Municipio Restrepo, *Ramos 2334* (♀), *2281* (♂) (MO, CUVC); Municipio El Cerrito, pueblo de Guabas, cerca de la frontera con Municipio Guacari, *Silverstone-Sopkin et al. 2294, 3662* (fr) (CUVC, MO).

**Zanthoxylum lenticulare** Reynel, sp. nov. TYPE: Colombia. Antioquia: Municipio de Anorí, Corregimiento de Providencia, entre Dos Bocas y Anorí, Buenos Aires, 4 km from Providencia, 400–900 m, aprox. 7°N, 75°W, May 1973 (fr), *Soejarto et al. 4058* (holotype, COL; isotypes, F, GH, MO). Figure 1B.

Haec species *Z. compacto* (Huber ex Albuquerque) P. G. Waterman affinis, sed ab eo foliis 40–70 cm longis 13–21-foliolatis, foliolis 8–12 cm longis, subcaudatis, marginibus minute crenulatis; paniculis amplissimis congestis 15–35 cm longis, 3(–4)-ramificatis, axibus primariis non fistulosis, axibus secundariis 4–13 cm longis; petalis 1.5–1.9 mm longis; coccis discoideis laevibus 3–4 mm longis, seminibus 2.5–3 mm longis differt.

Dioecious, myrmecophilous treelet or tree to 12 m tall; apical branchlets hollowed, 4–8 mm thick, with sparse, straight, compressed-conical spines to 6 mm long and lenticels to 0.5 mm long, the branchlets covered with sparse to dense, white, simple hairs to 0.1 mm long or glabrescent. *Leaves* evenly distributed on branchlets, imparipinnate, (11–)13–21(–25)-foliolate, 40–70 cm long; petiole (5.5–)7–10(–15) cm long; rachis terete, narrowly and deeply canaliculate, 2–4 mm thick, interjuga (2.5–)3–4.5 cm long, sometimes with 1(2) abaxial spines to 5 mm long, the rachis covered with indument similar to the branchlets; leaflets chartaceous to submembranaceous, drying pale green to reddish brown above, pale green beneath, laterals opposite to alternate, sessile, terminal leaflet with petiolule 2–10 mm long, ultimate pair or terminal leaflet usually larger than rest, all leaflets oblong to subovate, (2.5–)8–12(–15) × 2–4.5 cm, the apex acuminate to caudate, the acumen to 15 × 5 mm, base acute; margin crenate, the teeth separated 1–1.5 mm at the middle of leaflets; leaflets without hairs; midvein adaxially prominulous; few rounded glands 0.2–0.3 mm diam. usually present on abaxial blade near midvein; secondary veins 16–22 pairs, prominulous on both sides, tertiary veins usually prominulous and subreticulate on both sides. *Inflorescences* terminal or subterminal, multiflorous, congested panicles (8–)15–35 × (8–)15–22 cm, branched 3(–4) times; main axis 2–4 mm thick, secondary axes 4–13 cm long, mostly forming

a 60°–90° angle with main axis, the inflorescence axes covered with sparse to dense, white, simple hairs to 0.05(–0.1) mm long or glabrescent; inflorescence bracts deltoid to ovate, 0.2–0.5(–1) × 0.3–0.5 mm, covered with indument similar to inflorescence axes, usually ciliate. *Flowers* 5-merous; floral bracts (1)2–5 at base of pedicel, ovate to lanceolate, 2–3 × 1 mm, covered with indument similar to inflorescence axes or glabrescent; pedicel terete, 0.2–0.7 × 0.1–0.2 mm (–2.5 × 0.5 mm in fruit), glabrescent; calyx 0.5–0.7 × 0.8–1 mm, sepals connate ½ their total length, ovate, 0.3–0.4 mm broad, rounded to acute, glabrescent; petals saccate, ovate, 1.5–1.9 × 0.8–1.1 mm, the apex rounded, usually apiculate with apiculum to 0.2 mm long, also with an ellipsoid gland to 0.2 mm diam., the petals glabrous. *Staminate flowers* with stamens 5, exserted ⅓ to ½ their length, the filaments slender, 2–3 mm long, anthers 0.8–1 mm long, thecae oblong; nectary conical-truncate, 5-lobate, 0.3–0.4 × 0.3–0.6 mm; pistillodes 1–3, elongate-pyriform, distinct to totally connate, 0.2–0.5 × 0.2 mm. *Pistillate flowers* with no staminodes; gynophore conical, 0.2–0.3 × 0.4–0.6 mm; carpels (2)3, distinct except in the common stigma, ovaries oblongoid, 0.4–0.6 × 0.4–0.6 mm; styles terete, attached at adaxial upper half of ovaries, 0.1–0.2 × 0.1–0.2 mm; stigma discoid. *Fruit* apocarpous, (2–)3-follicular, frequently 1–2 follicles aborting; follicles discoid, 3–4 × 3 mm, glabrous; seed subdiscoid, 2.5–3 × 0.6–0.9 mm, the funicular scar linear, 1–2 × 0.3–0.4 mm. Common name: "Sando."

*Distribution.* Colombia (Antioquia) and Venezuela (Táchira and Zulia), between 90 and 900 m, in wet primary forests.

Three other New World species of *Zanthoxylum* also have hollow, myrmecophilous apical branchlets, which are very consistent and of practical value for identification. The following key allows the comparison of related species.

KEY TO MYRMECOPHILOUS NEOTROPICAL SPECIES OF *ZANTHOXYLUM*

1a. Apical branchlets with enlarged, interspaced zones of clustered leaf scars; panicles clustered at the apex of branchlets . . *Zanthoxylum setulosum*
1b. Apical branchlets uniformly terete; panicles solitary, terminal.
  2a. Leaves velutinous-pubescent; leaflets 5–12 cm broad . . . . . *Zanthoxylum formiciferum*
  2b. Leaves glabrous or glabrescent; leaflets 1–5 cm broad.
    3a. Panicles compact, 3–10 cm broad; fruit with follicles ovoid to obovoid, 6–9 mm long . . . . . *Zanthoxylum compactum*
    3a. Panicles expanded, 15–22 cm broad; fruit with follicles discoid, 4–4.5 mm long . . . . . *Zanthoxylum lenticulare*

*Paratypes.* COLOMBIA. **Antioquia:** Municipio San Luis, cañón del río Claro (♂), *Cogollo 831* (COL, MO); Municipio Tarazá, Río Cauca, right margin on road from El Doce to Barro Blanco, 8°35′N, 75°25′W (fr), *Daly et al. 5253* (COL, F, NY); Río Claro, camino al Refugio (♀, fr), *Rentería et al. 2855* (COL, MO); Municipio Anori, Río Anori valley, near Planta Providencia, 7°30′N, 74°50′W, *Shepherd 374* (COL, MO, WIS), 6 Aug. 1977, *913* (COL, MO, WIS); Corregimiento de providencia, entre Dos Bocas y Anori, Buenos Aires, ca. 7°N, 75°W (♂), *Soejarto 3922* (COL, F(2), MO). VENEZUELA. **Carabobo:** vicinity of Las Trincheras, near Valencia, *H. Pittier 7655* (GH). **Táchira:** ca. 10.5 km NE of La Fría, 90 m, 8°16′N, 72°10′W, 16 Nov. 1979 (♂), *J. Steyermark et al. 120511* (MO, NY, VEN). **Zulia:** Distrito of Colón, aldea Querrequerre, 12–15 km N of Casigua (fr), *Bunting et al. 7427* (NY, VEN).

**Zanthoxylum lepidopteriphilum** Reynel, sp. nov. TYPE: Peru. Piura: Prov. Huancabamba, Canchaque, between "Chorro Blanco" and "Warwar," 2000–2500 m, 18 Jan. 1989 (fr), *C. Díaz, T. D. Pennington & C. Reynel 3192* (holotype, MO; isotypes, K, MOL, USM). Figure 2A, C.

Haec species *Z. mantaro* (J. F. Macbride) J. F. Macbride affinis, sed ab eo foliis 32–45 cm longis, foliolis 9–17(–25), 7–10(–13) cm longis, basibus abaxialibus bis revolutis cylindrum marginalem formantibus 8–10(–14) mm longis; panicula ampla 9–14 cm longa (infructescentia usque ad 20 cm longa); petalis 2–3 mm longis; coccis 5–8(–10) mm longis, seminibus 5–6 mm longis differt.

Dioecious trees to 20 m tall; apical branchlets terete, 7–10 mm thick, unarmed, covered with sparse to dense, white or yellow, stellate, bifid and simple hairs 0.2–0.6 mm long. *Leaves* evenly distributed on branchlets, imparipinnate, 32–45 cm long, 9–17(–25)-foliolate; petiole (3.5–)4–10 cm long; rachis terete, obscurely canaliculate, 2–4 mm thick, interjuga 3–5 cm long, the rachis covered with indument similar to branchlets or glabrescent; petiolules 3–5 mm long; leaflets chartaceous, drying olive green to reddish brown on both sides, laterals opposite, ultimate or medial pair larger than rest, all leaflets oblong, 7–10(–13) × 2.5–3(–3.5) cm, the apex emarginate, rounded or acuminate, with acumen to 6 × 4 mm, base acute, oblique in laterals, tubular-twice-revolute 8–10(–14) mm or more along margin, each side of the midvein; margin entire to slightly crenate, with teeth separated 2–3 mm at the middle of leaflets; leaflets covered with sparse to dense, white to yellow, stellate, bifid and simple hairs to 0.2–0.5 mm especially along midvein and abaxial base, or glabrescent; midvein adaxially narrowly and deeply impressed; secondary veins 12–16 pairs, prominulous on both sides, tertiary veins usually prominulous and subreticulate on both sides. *Inflorescences* terminal or subterminal panicles, branched 1–2 times, pauciflorous to submultiflorous, 9–14 × 2.5–5.5 cm (–20 × 20 cm in fruit); main

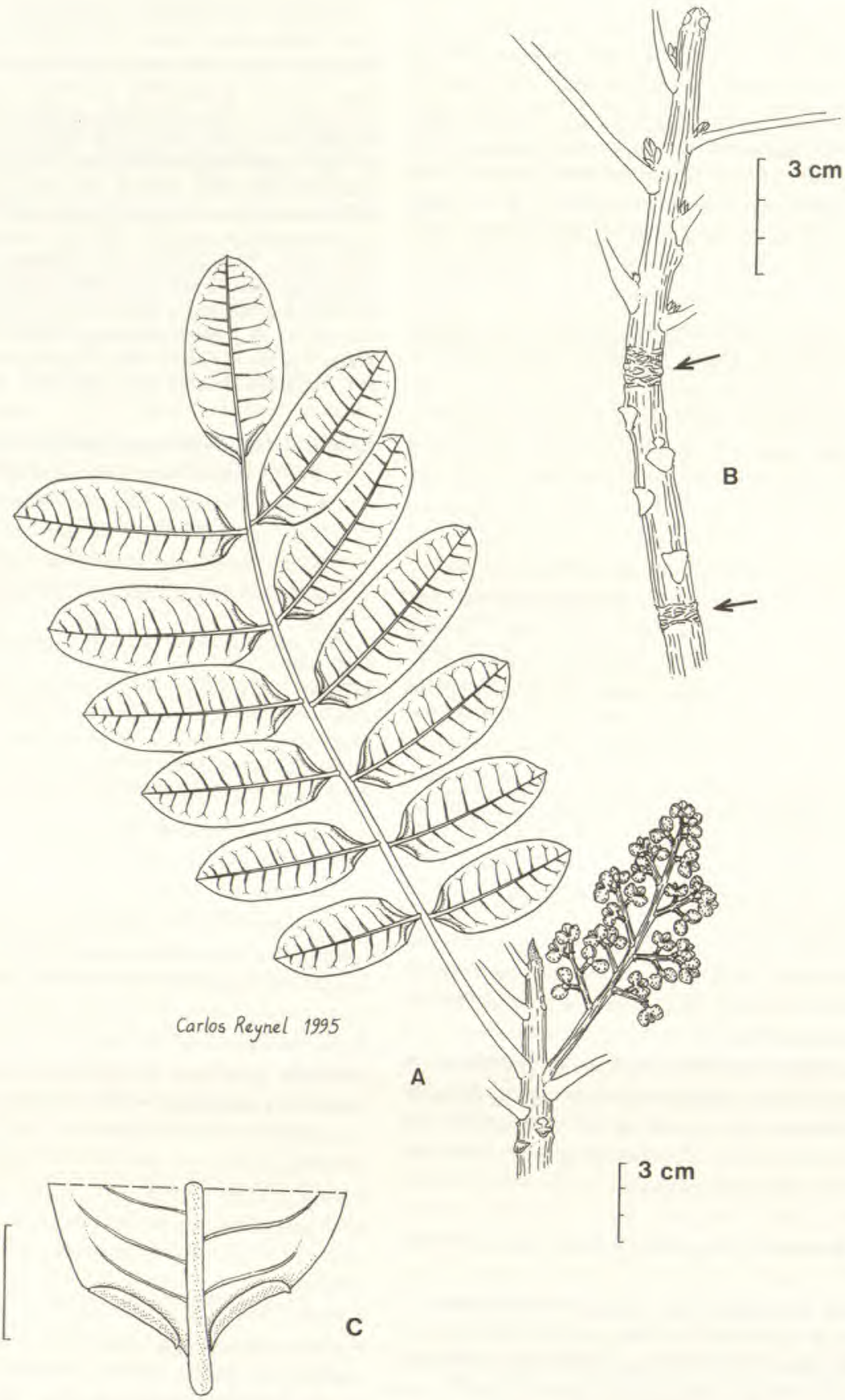


Figure 2. —A. *Zanthoxylum lepidopteriphilum* Reynel, apical branchlet with leaf and infructescence (*Diaz et al. 3192*). —B. *Zanthoxylum gentryi* Reynel, apical branchlet showing short zones of clustered leaf and bud-scale scars (arrows) (*Silverstone-Sopkin et al. 2294*). —C. *Zanthoxylum lepidopteriphilum* Reynel, leaflet showing the basal margin abaxially tubular-revolute each side of the midvein (*Díaz et al. 3192*).

axis 2–3 mm thick (–5 mm in fruit), secondary axes 1–2 cm long (–6 cm in fruit), the inflorescence axes covered with sparse to dense, stellate, bifid and simple hairs 0.2–0.8 mm long; inflorescence bracts deltoid to lanceolate or ovate, 0.5–1.3 × 0.5–0.7 mm, covered with indument similar to inflorescence axes. *Flowers* 5-merous; floral bracts 1(–3) at base of pedicel, ovate to deltoid, 0.4–0.6 × 0.3–0.6 mm, with indument similar to inflorescence axes; pedicel subterete, 0.6–1.2 × 0.6–0.8 mm; calyx with sepals basally connate to ⅓ their total length, ovate to deltoid, 0.8–1.2 × 0.5–0.8 mm, covered with sparse, stellate, bifid and simple hairs 0.3–0.5 mm long, usually ciliate; petals oblong to ovate, 2–3 × 1.2–1.6 mm, saccate, the apex inflexed, rounded, usually apiculate, with apiculum 0.2–0.4 mm long, petals covered with scattered, stellate, bifid or simple hairs 0.2–0.4 mm long, subciliate. *Staminate flowers* with 5 stamens, exserted to ⅓ their total length, filaments slender, 2.5–3.8 mm long, anthers oblongoid, 0.8–1 mm long, the connective with an obscure apical gland 0.1–0.2 mm diam.; nectary conical-truncate to discoid, basally 5-lobed, 0.4–0.6 × 0.9–1.2 mm; pistillodes 2–3, distinct to connate, pyriform-elongate, 0.6–0.9 × 0.3–0.4 mm. *Pistillate flowers* with staminodes 0–5, membranous, ovate to oblong, 0.4–0.6 × 0.2–0.3 mm; gynophore conical, 0.6–1.2 × 0.7–1.4 mm; carpels 3–5, free except in the common stigma, ovaries obovoid, 0.7–1.3 × 0.8–1.3 mm; styles attached at adaxial upper half of ovaries, 0.3–0.5 × 0.2–0.3 mm, stigma discoid, 3–5-lobed, 1.5–2.1 mm diam., 0.2–0.4 mm thick. *Fruit* apocarpous, 2–3(–5)-follicular, frequently 1–3 follicles aborting; pedicel 3–5 × 1.7–2.3 mm, with indument similar to inflorescence axes; follicles globose to obovate-compressed, 5–8(–10) mm long, glabrescent; seed globose to ovoid-compressed, 5–6 × 4–5 mm, the funicular scar linear, 4–5 × 0.4–0.7 mm.

*Distribution.* Ecuador (Imbabura, Loja, Pichincha) and Peru (Piura, Cajamarca), 1000–2500 m, in montane cloud forests.

The New World species of *Zanthoxylum* with differentiated and 5-merous perianths, placed in *Fagara* subsection Paniculatae–Neogaeae by Engler (1896), frequently have lateral leaflets with basally slightly to strongly revolute margins. *Zanthoxylum lepidopteriphilum* is unique in having the basal margin twice-revolute, forming a conspicuous cylinder 8–10(–14) mm long along the margin on each side of the midvein (Fig. 2C). The larvae of an unidentified lepidopteran have been found to inhabit the interior of this marginally formed cylinder. *Zanthoxylum lepidopteriphilum* is similar to *Z. mantaro* (J. F. Macbride) J. F. Macbride in its apical branchlets and leaves with indument of simple, bifid and stellate hairs and 5-merous, 3–5-carpellate flowers, but differs in its markedly larger terminal buds, leaves, leaflets, and inflorescences; sizes of these organs for both species compare as follows (first measurement for *Z. lepidopteriphilum*, second for *Z. mantaro*): leaves 32–45 cm long vs. 9–15 cm long; leaves 9–17(–25)-foliolate vs. 5–7(–9)-foliolate; petioles 4–10 cm long vs. 1.5–3.5 cm long; leaflets 7–10(–13) cm long vs. (2–)3–6(–9) cm long; and inflorescences 9–14 cm long (–20 cm in fruit) vs. (2.5–)4–6 cm long (–9 cm in fruit).

*Paratypes.* PERU. **Cajamarca:** San Miguel, Distrito La Florida, Agua Azul (fr), *Díaz 2095* (MO, MOL, TEX, USM). **Piura:** Cerro Aypate, 49 k E of Ayabaca, in disturbed dry cloud forest, 4°35′S, 79°32′W, *Gentry et al. 75045* (MO, USM). ECUADOR. **Imbabura:** Cantón Urcuquí, Balneario Cachimbio, 0°27′N, 78°14W (♂), *W. Palacios 5241* (MO, QCA). **Loja:** Cantón Sozoranga, slope of San Fernando, exiting Las Cochas, 4°18′S, 79°57′W (fr), *Palacios 3321* (MO, QCA). **Pichincha:** Reserva Geobotánica Pululahua, between La Reventazón and Pululahua, 0°05′N, 78°30′W, (♀, fr) *C. Ceron et al. 5673* (MO, QCA).

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Literature Cited

Beurton, C. 1994. Gynoecium and perianth in *Zanthoxylum* s. l. (Rutaceae). Pl. Syst. Evol. 189: 165–191.

Brizicky, G. 1962. Taxonomical and nomenclatural notes on *Zanthoxylum* and *Glycosmis* (Rutaceae). J. Arnold Arbor. 43: 80–93.

Engler, A. 1874. Rutaceae. *In:* C. Martius, Flora Brasiliensis 12(2): 7–196.

———. 1896. Rutaceae. *In:* A. Engler & K. Prantl, Die Natürlichen Pflanzenfamilien 3(4): 114–119.

———. 1931. Rutaceae. *In:* A. Engler & K. Prantl, Die Natürlichen Pflanzenfamilien, Ed. 2. 19a: 214–224.

Hartley, T. 1966. A revision of the Malesian species of *Zanthoxylum*. J. Arnold Arbor. 47: 171–221.

Waterman, P. G. 1975a. New combinations in *Zanthoxylum* L. Taxon 24: 361–366.

———. 1975b. Alkaloids of the Rutaceae: Their distribution and systematic significance. Biochem. Syst. Ecol. 3: 149–180.

———. 1976. Further new combinations in *Zanthoxylum* L. Taxon 25: 594.

———. 1977. A review of the chemosystematics of the genus *Zanthoxylum* L. (Rutaceae). Pp. 109–129 *in* B. Stone (editor), The Role and Goals of Tropical Botanic Gardens. Univ. of Malaya, Kuala Lumpur.

———. 1983. Phylogenetic implications of the distribution of secondary metabolites within the Rutales. Pp. 377–400 *in* P. G. Waterman & M. Grundon (editors), Chemistry and Chemical Taxonomy of the Rutales. Academic Press, London.

Yamazaki, T. 1988. Floral anatomy of the genus *Zanthoxylum* L. J. Jap. Bot. 63: 7–16.

# New Combinations and a New Variety in Mesoamerican *Dalbergia* (Fabaceae: Papilionoideae)

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ABSTRACT. Six new combinations with change of status are proposed to reflect the interrelationship as well as the singularity of the taxa: *Dalbergia glabra* var. *chontalensis*, *D. glabra* var. *paucifoliolata*, *D. retusa* var. *cuscatlanica*, *D. retusa* var. *hypoleuca*, *D. retusa* var. *lineata*, and *D. retusa* var. *pacifica*. One variety, *D. calderonii* var. *molinae*, is described as new.

Most species of Mesoamerican *Dalbergia* were originally described from one or a few specimens. As more material has become available gradation of characters has become evident. Many of the differences between taxa are subtle, and there is considerable intergradation. In some cases reduction in rank appears to be warranted; in one, differences are deemed worthy of recognition as a new variety.

**Dalbergia glabra** (Miller) Standley var. **chontalensis** (Standley & Williams) Rudd, comb. et stat. nov. Basionym: *Dalbergia chontalensis* Standley & Williams, Ceiba 1: 81. 1950. TYPE: Nicaragua. Chontales: vecindad de Juigalpa, en matorrales de una cuesta rocosa, alt. 160 m, 4–13 June 1947, *Standley 9296* (holotype, F).

**Dalbergia glabra** (Miller) Standley var. **paucifoliolata** (Lundell) Rudd, comb. et stat. nov. Basionym: *Dalbergia paucifoliolata* Lundell, Contr. Univ. Michigan Herb. 4: 8. 1940. TYPE: Mexico. Tabasco: Reforma on the Río San Mártir above Balancan, on river bank, 22–26 May 1939, *Matuda 3167* (holotype, MICH).

**Dalbergia retusa** Hemsley var. **cuscatlanica** (Standley) Rudd, comb. et stat. nov. Basionym: *Amerimnon cuscatlanicum* Standley, J. Wash. Acad. Sci. 13: 442. 1923. TYPE: El Salvador. San Salvador: 1923, *Calderón 1557* (holotype, US).

**Dalbergia retusa** Hemsley var. **hypoleuca** (Pittier) Rudd, comb. et stat. nov. Basionym: *Dalbergia hypoleuca* Pittier, J. Wash. Acad. Sci. 12: 62. 1922. TYPE: Costa Rica. Alajuela: El Escobal, near Atenas, *Golcher 1747* (holotype, US, originally in John Donnell Smith herbarium).

**Dalbergia retusa** Hemsley var. **lineata** (Pittier) Rudd, comb. et stat. nov. Basionym: *Dalbergia lineata* Pittier, J. Wash. Acad. Sci. 12: 63. 1922. *Amerimnon lineatum* (Pittier) Standley, J. Wash. Acad. Sci. 13: 442. 1923. TYPE: Costa Rica. Guanacaste: Nicoya, Apr. 1900, *Tonduz 13969* (holotype, US).

**Dalbergia retusa** Hemsley var. **pacifica** (Standley & Steyermark) Rudd, comb. et stat. nov. Basionym: *Dalbergia pacifica* Standley & Steyermark, Field Mus. Nat. Hist., Bot. Ser. 22: 236. 1940. TYPE: Guatemala. Suchitepéquez: Cocales, roadside, 215 m, 5 Jan. 1939, *Standley 62109* (holotype, F).

**Dalbergia calderonii** Standley var. **molinae** Rudd, var. nov. TYPE: Honduras. Morazán: floresta de nubes area Rancho Quemado, suroeste de San Juancito, 2000 m, 19 June 1948, *Molina 1040* (holotype, F).

Arbores nubiculae a varietate typica foliis plerumque longis, foliolis parviis numerosisque differunt.

Trees 4–8 m high. Leaves (11–)13–15-foliolate, the axis about 15–20 cm long. Leaflets 4–6 × 1.5–2.5 cm, elliptic, obtuse to acute. Flowers cream to orange-yellow, 4.5–5 mm long. Fruit brown-velutinous, 7–8 × 1.5 cm, the stipe about 8–10 mm long.

*Dalbergia calderonii* var. *calderonii* occurs at lower elevations and different habitat than variety *molinae* (350–850 m in low to medium deciduous forest vs. ca. 1300–2100 m at the edge of cloud forest); it bears leaves with fewer leaflets ((3–)5–9(–11)-foliolate, with an axis 6–10 cm long vs. (11–)13–15-foliolate, with an axis ca. 15–20 cm long); and its fruits have a shorter stipe (ca. 5 mm long vs. ca. 8–10 mm long).

*Paratypes.* HONDURAS. **Morazán:** bosque de nubes, entre Santa Lucía y Valle de Angeles, 1800 m, *Molina 330l* (F); Montaña La Tigre, suroeste de San Juancito, 2100 m, *Molina 10661* (F); edge of cloud forest, mountains above San Juancito, 2000 m, *Williams & Molina 13328* (F). NICARAGUA. **Jinotega:** bosque de la entrada a Aranguez, 1300–1400 m, *Araquistain 3640* (MO). **Matagalpa:** road to Aranguez, pasture and patches of cloud forest, 1360–1380 m, *Stevens et al. 17067* (MO); cloud

forest area, Sta. María de Ostuma, between Matagalpa and Jinotega, 1300–1500 m, *Williams et al. 23442* (NY).

This variety is named in honor of Antonio Molina R., Honduran botanist, following a suggestion by P. H. Standley and L. O. Williams in an unpublished herbarium name.

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# Three New Species of *Clavija* (Theophrastaceae)

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ABSTRACT. Three new species of *Clavija*, *C. laplanadae* (Nariño, Colombia), *C. subandina* (Napo, Ecuador), and *C. obtusifolia* (Huánuco–San Martín, Peru), are described and illustrated, and their affinities are briefly discussed.

Since the completion of my revision of *Clavija* (Ståhl, 1991) many additional collections of the genus have been made or brought to my attention. In this material several undescribed species have been encountered. The three species described in this paper were all gathered in premontane or lower montane Andean forest, the type of habitat richest in species of *Clavija*.

**Clavija laplanadae** Ståhl, sp. nov. TYPE: Colombia. Nariño: La Planada Nature Reserve, S of Ricaurte, 1800 m, 78°02′W, 01°10′N, 28 Feb. 1992 (fl), *Ståhl & Eriksen 652* (holotype, COL; isotypes, GB, PSO, herbarium of the La Planada Nature Reserve). Figure 1.

Arbor parva ad 4 m alta, surculis glabris. Folia petiolis 7–11 cm longis; lamina oblanceolata vel anguste oblanceolata, 60–120 × 12–28 cm, absque sclerenchymate subepidermali, basi angustata, apice obtuso vel rotundato, margine serrulato vel integro, venis lateralibus conspicuis. Racemi ad 45 cm longi; flores 15–40, 5-meri. Calyx lobis 2.5–2.7 × 2.5–3 mm. Corolla tubo 4 mm longo, lobis 7.0–8.0 × 7.5–8.5 mm. Ovula 3–10. Fructus ignotus.

Treelet to 4 m high, unbranched or rarely sparsely branched, stem to ca. 8 cm diam., young shoots glabrous, brown or light brown. Leaves arranged in 1, 2, or rarely 3 pseudowhorls toward the summit of main stem or branches; blade oblanceolate to narrowly oblanceolate, 60–120 × 12–28 cm, papyraceous when dry, 0.25–0.30 mm thick, somewhat bullate, glabrous, dark green, without subepidermal, extraxyllary sclerenchyma, base narrowly attenuate, apex rounded or obtuse, often somewhat retuse, margins entire or sparsely and minutely serrulate with teeth usually most numerous toward base, lateral veins conspicuous, particularly beneath, surfaces between veinlets smooth; petiole 7–11 cm long, 5–8 mm thick, glabrous. Racemes pendent, to 45 cm long with 15–40 flowers, rachis 2–3 mm thick at base, glabrous, pedicels 4–5 mm long, bracts 0.6–0.8 mm long, inserted at the nodes. Flowers 5-merous, morphologically bisexual (unisexual flowers not seen); calyx seemingly glabrous, lobes broadly ovate, 2.5–2.7 × 2.5–3.0 mm, margins erose; corolla pale orange, tube 4 mm long, lobes very broadly ovate or subrotund, 7.0–8.0 × 7.5–8.5 mm. Staminodes ovoid-gibbous, completely fused with corolla, alternating with the lobes. Stamen filaments glabrous, fused into a tube 1.5 mm long. Pistil narrowly ovoid, 3.0 × 1.0 mm, stigma 2-lobed; ovules 3–10 in 1 or 2 rows. Fruits not seen.

This new species, distinguished by its huge leaves without extraxyllary subepidermal sclerenchyma, was collected during fieldwork in southern Colombia a few years ago. However, at the La Planada Field Station it had been known for a long time as one of the plants exhibited along their nature trail. It shows clear affinities with *Clavija eggersiana* Mez, a species of the moist, semideciduous forests of coastal Ecuador, differing primarily in its more rigid leaves with some subepidermal sclerenchyma and its much smaller flowers.

*Clavija laplanadae* is so far known solely from the type locality, but it is quite possible that a population at the Río Guajalito Reserve in Prov. Pichincha, Ecuador, should be referred to this species. The extant material from the Río Guajalito population is lacking flowers and was tentatively included in *C. eggersiana* in my previous treatments (Ståhl, 1990, 1991).

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**Clavija subandina** Ståhl, sp. nov. TYPE: Ecuador. Napo: Cantón Archidona, S slopes of Volcán Sumaco, on trail between El Pacto and Huahua Sumaco, 1600 m, 00°37′S, 77°35′W, 24 Oct. 1989 (fl), *Palacios & Neill 4725* (holotype, MO; isotype, GB). Figure 2.

Arbor parva ad 10 m alta, surculis glabris. Folia petiolis 3–7 cm longis; lamina oblanceolata, 35–60 × 7–12 cm,

Figure 1. *Clavija laplanadae* Ståhl. —A. Habit. —B. Leaf. —C. Inflorescence. —D. Flower in apical view showing corolla lobes, staminodes, and anthers. —E. Pedicel and calyx. A, unvouchered, drawn from photographic slides; B–E, based on *Ståhl & Eriksen 652* (GB).

basi angustata, apice acuto vel breviter acuminato, margine integro alboque, sclerenchymate in fasciculis subepidermalibus disposito, fasciculis adaxialibus immersis. Racemi ad 35 cm longi; flores 30–55, 4-meri. Calyx lobis 3.0–3.5 × 4.0–4.2 mm. Corolla tubo circiter 3 mm longo, lobis 6–7 × 6–7 mm. Fructus ignotus.

Tree to 10 m high, sparsely branched or unbranched, trunk ca. 10 cm diam., young shoots glabrous, brown. Leaf blade oblanceolate, 35–60 × 7–12 cm, coriaceous, 0.30–0.40 mm thick, glabrous, light green beneath, dark green above, with sub-

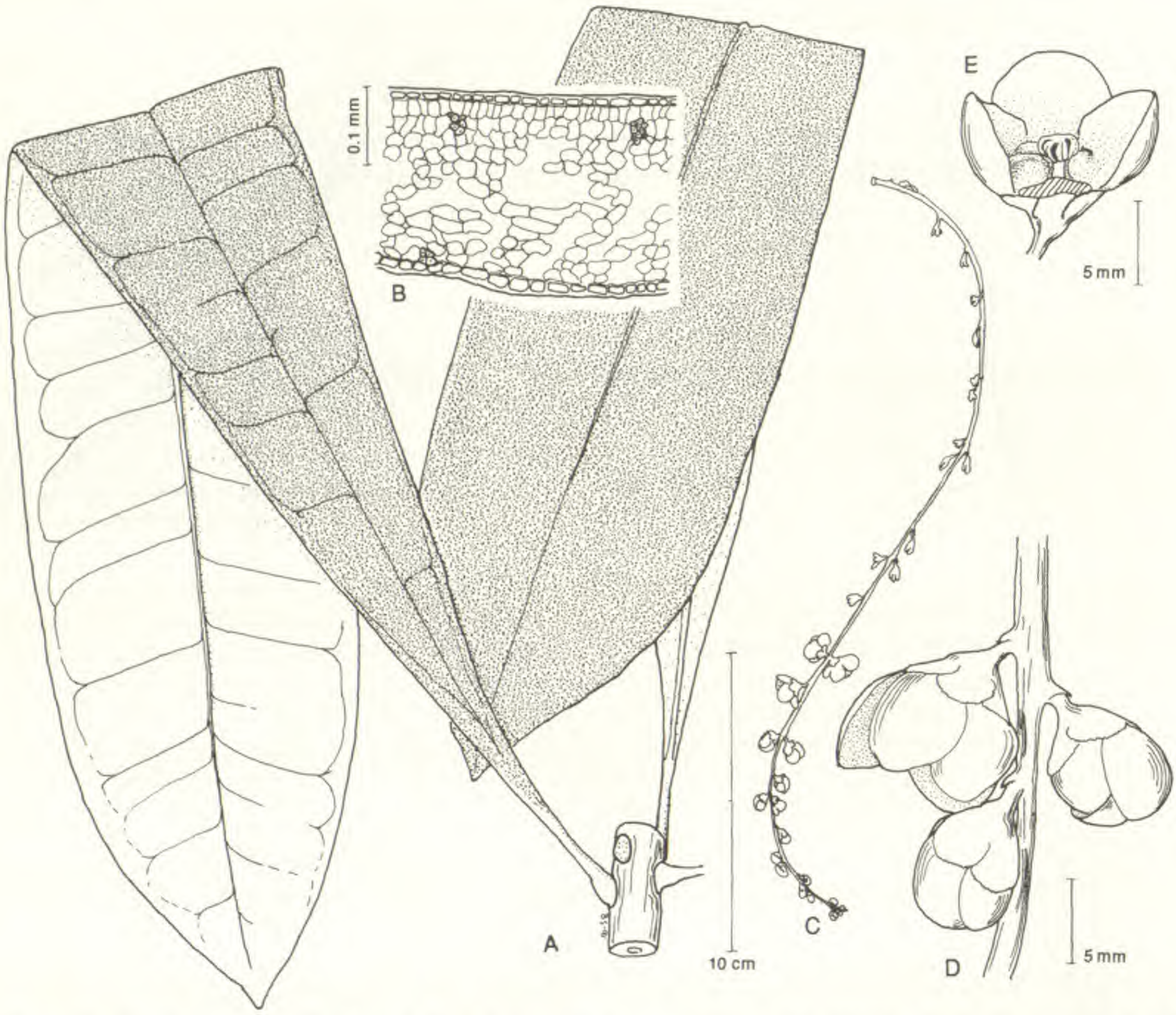


Figure 2. *Clavija subandina* Ståhl. —A. Part of stem with leaves. —B. TS of leaf blade, showing immersed adaxial bundles of sclerenchyma. —C. Inflorescence. —D. Flowers, in bud and at the beginning of anthesis. —E. Staminate flower with one corolla lobe removed showing stamen tube and staminodes. Based on *Palacios & Neill 4725* (MO).

epidermal bundles of extraxyllary sclerenchyma, the adaxial bundles somewhat immersed into the mesophyll, base narrowly attenuate, apex acute or shortly acuminate, margins entire with a rather conspicuous pallid border, lateral veins rather inconspicuous, surfaces between veins sparsely striate; petiole 3–7 cm long, 3–6 mm thick, glabrous. Racemes pendent, to 35 cm long with 30–55 flowers, rachis ca. 1.5 mm thick, glabrous, pedicels 2–3 mm long, bracts ca. 1 mm long, inserted at the nodes. Flowers 4-merous (only functionally staminate flowers seen); calyx lobes very broadly ovate, 3.0–3.5 × 4.0–4.2 mm, margins erose; corolla orange-red, tube ca. 3 mm long, lobes suborbicular, 6.0–7.0 × 6.0–7.0 mm. Stamen filaments glabrous, fused into a tube 2 mm long. Pistil very narrowly ovoid, ca. 3 × 0.5 mm, stigma entire. Fruits not seen.

*Clavija subandina* seems to be most closely related to *C. repanda* Ståhl, a species restricted to a small area of semi-deciduous, lower montane forest in southwestern Ecuador (Ståhl, 1986). That species differs from *C. subandina* in its repand leaf margins and by lacking or having very little extraxyllary foliar sclerenchyma; *C. repanda* seems also to be a smaller and more slender plant than *C. subandina.* An interesting leaf anatomical feature of *C. subandina* is the disposition of the adaxial sclerenchyma, which is not located adjacent to the epidermis as in most other species of the genus but slightly immersed into the subjacent mesophyll (Fig. 2B). This arrangement of the foliar sclerenchyma was previously known only in *C. venosa* Ståhl and *C. clavata* Decaisne (Ståhl, 1991), neither of which can be considered closely related to *C. subandina.*

*Clavija subandina* has been collected at about

1600–1800 m on the southern slopes of Volcán Sumaco. The discovery of a new species of *Clavija* at this elevation in the Ecuadorian Oriente is rather unexpected. On the eastern side of the Ecuadorian Andes the genus has previously been recorded only once from above 1000 m altitude (*C. weberbaueri* Mez, up to 1300 m). However, at least two species of *Clavija* are known from localities at or slightly above 2000 m on the Pacific slopes.

Despite the relatively isolated location of Volcán Sumaco, its páramo vegetation has been found to be floristically very similar to other páramo areas in Ecuador, including very few endemics, if any (Løjtnant & Molau, 1982). The discovery of *Clavija subandina*, as well as a recently described species of Menispermaceae from the same general area (Barneby, 1990), indicates that additional narrow endemics can be expected from the premontane and lower montane forests surrounding Volcán Sumaco.

*Paratypes.* ECUADOR. **Napo:** the Pacto Area, 40 km on road from Hollín to Loreto, 1800 m, 24–25 Aug. 1988 (ster.), *Jaramillo 023, 055* (both MO).

**Clavija obtusifolia** Ståhl, sp. nov. TYPE: Peru. Huánuco: Prov. Leoncio Prado, Dtto. Hermilio Valdizan, near La Divisoria, 1500–1600 m, 27 June 1976 (fl & young fr), *Schunke 9424* (holotype, MO). Figure 3.

Frutex ad 1 m altus, surculis puberulis. Folia petiolis 4–5 cm longis; lamina oblanceolata vel elliptica, 30–33 × 10–13 cm, basi angustata, apice obtuso, margine integro, paginis subtiliter striatis. Racemi 4–6 cm longi, ascendentes; flores 6–12, 5-meri. Calyx lobis 3.5–4.0 × 4.0–4.5 mm. Corolla tubo 2.5 mm longo, lobis 5.0 × 5.0–5.5 mm. Ovula circiter 15. Fructus 2.5–3.5 cm diam., seminibus 7–12.

Shrub to 1 m high, young shoots puberulous. Leaf blade oblanceolate to elliptic, 30–33 × 10–13 cm, subcoriaceous, 0.30–0.35 mm thick, glabrous, green above, pale green beneath, with subepidermal bundles of extraxyllary sclerenchyma adjacent to the epidermis on both sides, base attenuate, apex obtuse, margins entire, lateral veins rather inconspicuous, surfaces between veins striate; petiole 4–5 cm long, ca. 2 mm thick, glabrous. Racemes ascending, 4–6 cm long with 6–12 flowers, rachis 0.5 mm thick, sparsely and minutely puberulous, pedicels 4–5 mm long, distally thickened, bracts ca. 0.5 mm long, inserted at the nodes. Flowers 5-merous, morphologically bisexual (unisexual flowers not seen); calyx lobes very broadly ovate, 3.5–4.0 × 4.0–4.5 mm, margins vaguely erose; corolla orange-red, tube 2.5 mm long, lobes 5.0 × 5.0–5.5 mm. Stamen filaments glabrous, fused into a tube 1.5–1.7 mm long. Pistil ovoid, 3.0 × 1.5 mm, stigma indistinctly 2-lobed; ovules ca. 15 in two rows. Fruits 2.5–3.5 cm diam., pericarp 0.3 mm thick, smooth; persisting calyx lobes reflexed. Seeds 7–12, irregularly depressed-oblong, 8–11 × 7–8 mm.

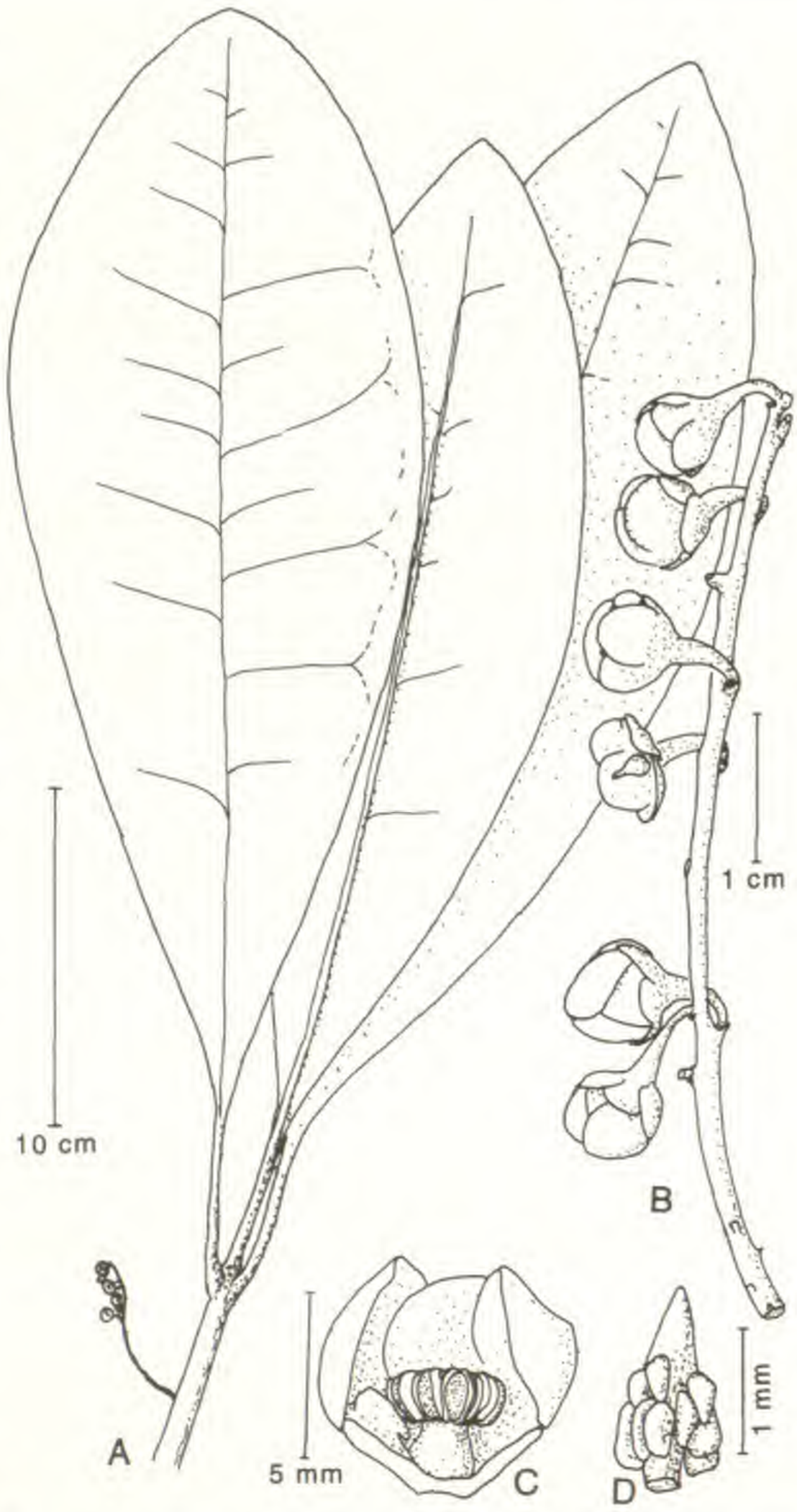


Figure 3. *Clavija obtusifolia* Ståhl. —A. Branchlet with leaves and inflorescence. —B. Inflorescence, flowers in late bud and (third flower from base) without corolla and stamens. —C. Corolla cut open to show staminal tube. —D. Placenta with ovules. Based on *Schunke 9424* (MO).

In shape and size of the leaves *Clavija obtusifolia* is similar to *C. weberbaueri* Mez, a species of wide distribution in the western Amazon. From *C. weberbaueri*, *C. obtusifolia* differs primarily in its much larger flowers. Other distinguishing features are the obtuse leaf apex, pale green lower leaf surface, and thick pedicels. In addition, morphologically bisexual flowers of *C. weberbaueri* have 1–3 ovules, whereas those of *C. obtusifolia* have ca. 15.

*Paratypes.* PERU. **San Martín:** Prov. Mariscal Cáceres, Dtto. Uchiza, Cachiyacu de Lopuna, 450–500 m, 11 July 1974 (fr), *Schunke 7323* (MO); Dtto. Tocache Nuevo, Quebrada de Challua-Gacu, ca. 500 m, 1 Feb. 1979 (fr), *Schunke 10757* (MO).

## Literature Cited

Barneby, R. C. 1990. Two new species of *Disciphania* (Menispermaceae: Tinosporeae) from subandean Ecuador and Peru. Brittonia 42: 178–181.

Løjtnant, B. & U. Molau. 1982. Analysis of a virgin páramo plant community on Volcán Sumaco, Ecuador. Nordic J. Bot. 2: 567–574.

Ståhl, B. 1986. Two new species of *Clavija* (Theophrastaceae) from NW South America. Nordic J. Bot. 6: 769–772.

———. 1990. Theophrastaceae. Pp. 1–21 *in* G. Harling & L. Andersson (editors), Flora of Ecuador 39. Dept. of Systematic Botany, University of Göteborg, Göteborg.

———. 1991. A revision of *Clavija* (Theophrastaceae). Opera Bot. 107: 1–77.

# *Eltroplectris brachycentron* Szlachetko (Orchidaceae), a New Orchid Species from Bolivia

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ABSTRACT. *Eltroplectris brachycentron* Szlachetko from Bolivia is described and illustrated, and its taxonomic position is briefly discussed. An illustrated key to the Bolivian species of *Eltroplectris* is provided.

The genus *Eltroplectris* Rafinesque, with 12 species, is comprised of terrestrial orchids from Central and South America. The characteristic feature of this genus is the presence of a threadlike spur, formed by lateral sepals fused to each other in their lower parts and the basal part of the lip. At first glance, *Eltroplectris* appears similar to *Pelexia* Poiteau ex Lindley. The two genera differ, however, in the structure of the rostellum and viscidium (Fig. 1). In *Eltroplectris,* the viscidium is semi-sheathlike and slips from the rostellum, leaving the subulate, sharp core of the rostellum. In *Pelexia,* the viscidium originates on the external surface of the rostellum, is massive and nodular; the rostellum remnant is ribbonlike and obtuse at the apex. *Eltroplectris* also appears to be related to *Pteroglossa* Schlechter. In both genera, the rostellum and viscidium are similar in structure; the differences primarily concern the structure of the spur. In *Eltroplectris* the lateral sepals are fused into a tube along the entire length of the free section of the spur, whereas in *Pteroglossa* the lateral sepals remain free to the apex of the spur. In *Eltroplectris,* the free section of the spur is more or less equal to the length of the part adhering to the ovary; in *Pteroglossa* the spur is only free at the apex and frequently forms a chin at the base of the ovary. In view of such clear criteria differentiating the two genera, the fact that Garay (1982) transferred *Eltroplectris lurida* (Correa) Pabst, a species closely related to *E. misera* (Kraenzlin) Szlachetko, to *Pteroglossa* is striking.

While studying herbarium material of *Eltroplectris* at BM, I found a new species from Bolivia.

**Eltroplectris brachycentron** Szlachetko, sp. nov. TYPE: Bolivia. Choreti, 3 mi. from Comiri, a pumping station on the pipeline above Rio Perapeti, 20°00′S, 63°30′W, 13 Sep. 1949, *Brooke 5634* (holotype, BM). Figure 2.

Species haec *E. miserae* propinqua, sed pede columnae et calcare ovario manifeste breviori et labello ad clinandrium adnato sub apicem constricto jam diagnoscenda.

Stem 28 cm long, 2 mm diam. at base, 1 mm diam. below inflorescence, erect, delicate, glabrous. No leaves at flowering time. Cauline bracts 8, herbaceous, transparent, membranous, acute, adnate to the stem, lower bracts longer, upper bracts shorter than internodes. Inflorescence 12.5 cm long, 25- to 30-flowered, multilateral, lax. Flowers small, arcuate, glabrous. Floral bracts 9 mm long, ovate-lanceolate, acuminate, 3-nerved, herbaceous, transparent, membranous, in lower flowers longer than ovaries, in upper ones equal in length to ovaries. Ovary 6 mm long, twisted at base, ovary neck about 1 mm long. Dorsal sepal 5 mm long, 1.8 mm wide, ovate-lanceolate, acuminate, 3-nerved, slightly concave in the center, fleshy, thickened at the apex. Free part of the lateral sepals 4 mm long, 1.3 mm wide, lanceolate, acuminate, 3-nerved, delicate, rather fleshy, slightly thickened at apices. Petals 4 mm long, 1 mm wide, lanceolate-falcate, subobtuse, 3-nerved, thin, slightly adnate to dorsal sepal. Lip subsessile, constricted at the apex, thin, delicate, papillate, distinctly adnate to the clinandrium; basal part of hypochile 3.2 mm long, 0.8 mm wide, linear, apical part of hypochile 3.2 mm long, 2.5 mm wide, oval; epichile 1 mm long, 0.9 mm wide, ovate, obtuse. Spur partially free, formed from the column foot, lip and basal parts of lateral sepals, as long as one-half of the ovary. Free part of the spur 1 mm long, subulate. Gynostemium 3 mm long, erect, short, relatively massive. Column foot 3 mm long, with the apical 1 mm free. Anther 1.8 mm long. Rostellum remnant 0.4 mm long, subulate, acute.

*Etymology: brachys* (Greek), short; *centron* (Greek), spur; an allusion to the short and sharply pointed spur.

*Eltroplectris brachycentron* Szlachetko is closely related to *E. misera* (Kraenzlin) Szlachetko. Both of the species share a similar habit and gynostemium structure, but differ in the length of the spur, lip form, and adnation between lip and clinandri-

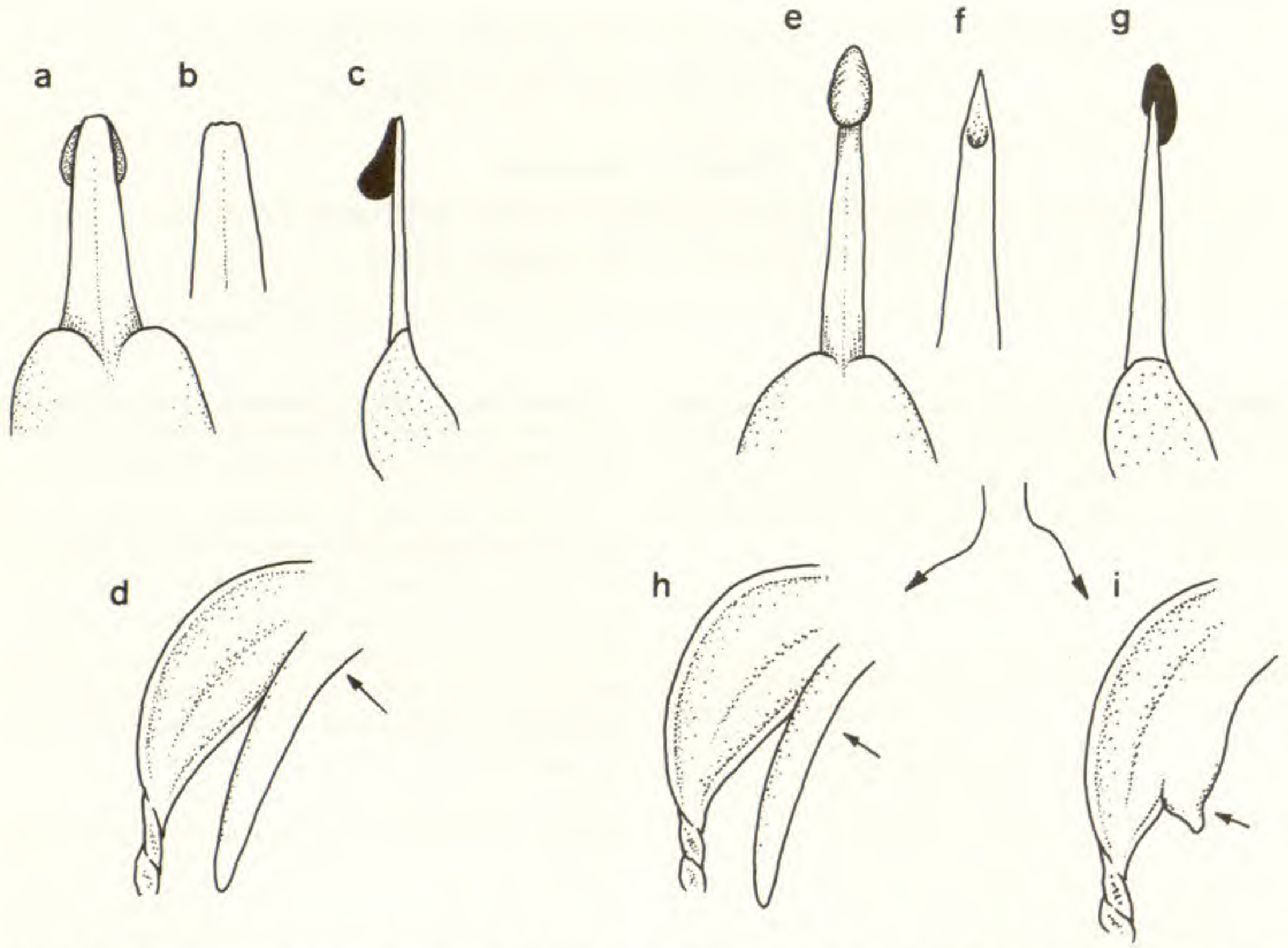



Figure 1. Gynostemium structure and spur of *Pelexia* (a–d), *Eltroplectris* (e–g, h) and *Pteroglossa* (e–g, i). —a, e. Rostellum with viscidium, bottom view. —b, f. Rostellum remnant. —c, g. Longitudinal section of rostellum and viscidium. —d, h, i. Spur, pedicel, and ovary.

um. In *E. brachycentron* the spur reaches to the mid point of the ovary, the lip is distinctly constricted at the apex, and the side lobes of the lip are agglutinate with the clinandrium. In *E. misera* the spur is as long as the ovary, the lip is not divided into a hypochile and epichile, and it is completely free from the clinandrium. *Eltroplectris misera* (Kraenzlin) Szlachetko is well illustrated by Dodson & Vasquez (1989a: 214) (as *E. travassosii* (Rolfe) Garay).

It is worth noting that apart from *E. brachycentron* and *E. misera*, three other species of the genus are known so far from Bolivia: *E. longicornu* (Cogniaux) Pabst, described and known hitherto only from southern Brazil; *E. triloba* (Lindley) Pabst, illustrated by Dodson & Vasquez (1989b: 321) as *E. calcarata* (Swartz) Garay & Sweet; and *E. roseo-alba* (Reichenbach f.) Hamer & Garay.

The Bolivian species of *Eltroplectris* can be separated as follows (Fig. 3):

1a. Lip elliptic in general outline, usually constricted near the middle, flowers large, leaves gathered in the basal rosette, obovate, subsessile . . *E. roseo-alba*

1b. Lip of different shape, constricted near the apex if at all, flowers small, leaves petiolate if present at flowering time.
  2a. Hypochile linear in the basal part, ± dilated in the apical part, side lobes rounded.
    3a. Lip constricted near the apex, apical half of hypochile elliptic, spur half as long as the ovary . . . . . *E. brachycentron*
    3b. Lip not constricted, the apical half narrowly elliptic, spur nearly as long as the ovary . . . . . *E. misera*
  2b. Hypochile triangular, side lobes triangular, epichile ligulate to lanceolate.
    4a. No leaves at flowering time, spur longer than ovary and pedicel, lateral sepals lanceolate . . . . . *E. longicornu*
    4b. Leaves long petiolate, forming the basal rosette at flowering, spur as long as the ovary and pedicel or shorter, lateral sepals strongly falcate . . . . . *E. triloba*

*Acknowledgments.* I am grateful to the curator of BM for the hospitality during my visit, and Ryszard Ochyra for the latinization of the diagnosis.

Literature Cited

Dodson, C. H. & R. Vasquez Ch. 1989a. Orchids of Bolivia. Icones Plantarum Tropicarum. Ser. 2, fasc. 3: 201–300. Missouri Botanical Garden, St. Louis.

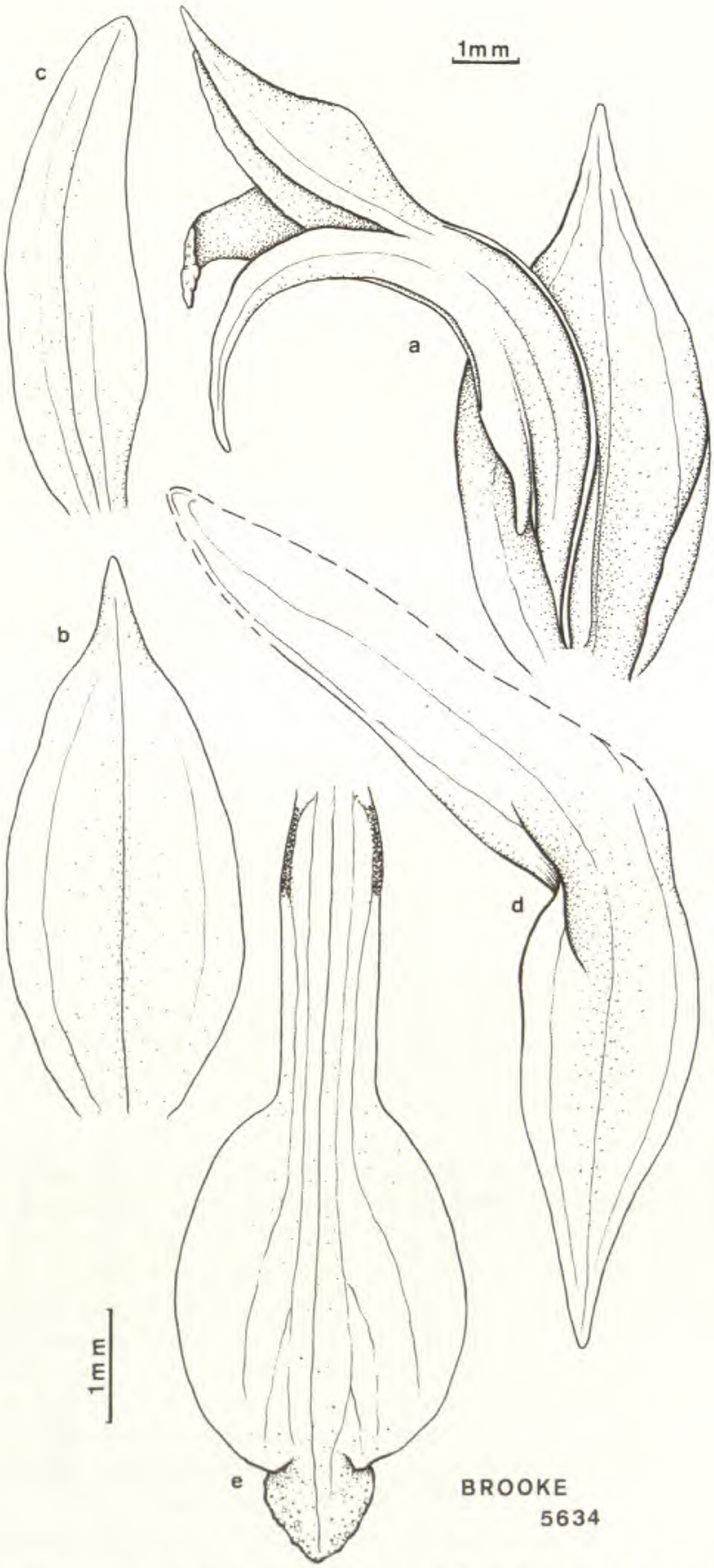
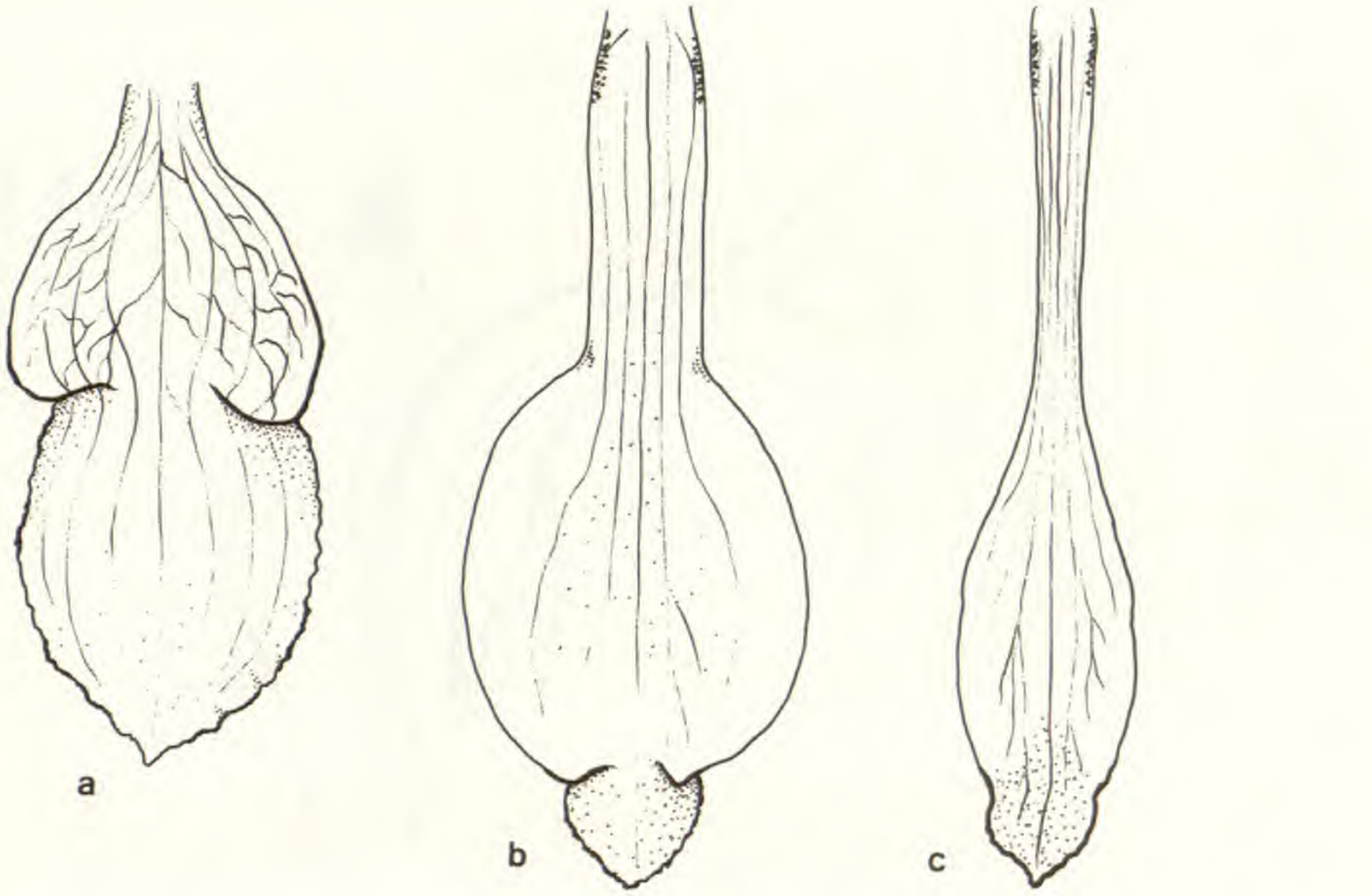



Figure 2. *Eltroplectris brachycentron* Szlachetko. —a. Flower and floral bract. —b. Dorsal sepal. —c. Petal. —d. Lateral sepal. —e. Lip. Drawn from the holotype.



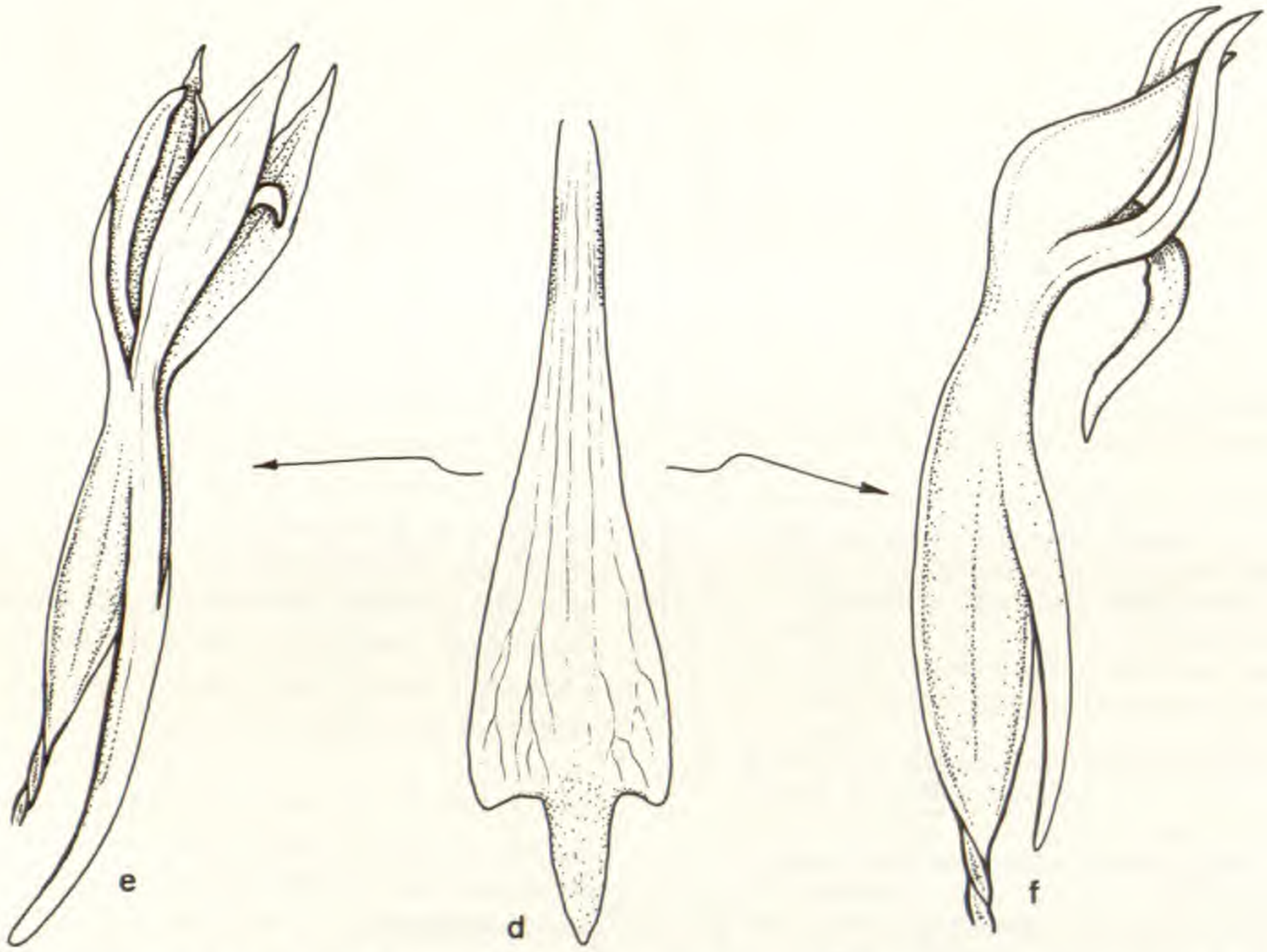




Figure 3. An illustrated key to the Bolivian species of *Eltroplectris*. —a. *E. roseo-alba* (Reichenbach f.) Hamer & Garay. —b. *E. brachycentron* Szlachetko. —c. *E. misera* (Kraenzlin) Szlachetko. —d. Lip shape of *E. longicornu* (Cogniaux) Pabst (e) and *E. triloba* (Lindley) Pabst (f).

——— & ———. 1989b. Orchids of Bolivia. Icones Plantarum Tropicarum. Ser. 2, fasc. 4: 301–400. Missouri Botanical Garden, St. Louis.

Garay, L. A. 1982. A generic revision of the *Spiranthinae*. Bot. Mus. Leafl. Harvard Univ. 28(4): 277–425.

# New Taxa of Rubiaceae from Amazonian Colombia, Ecuador, and Peru

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ABSTRACT. The new taxa *Coussarea linearis* C. M. Taylor, *Palicourea macarthurorum* C. M. Taylor, and *P. quadrifolia* subsp. *leticiana* C. M. Taylor are described based largely on material collected during floristic inventories of several biological reserves in northwestern Amazonia.

During preparation of floras of the Parque Nacional Natural Amacayacu in southern Amazonas Department, Colombia, and several biological reserves near Iquitos, Peru, the following undescribed taxa were discovered.

**Coussarea linearis** C. M. Taylor, sp. nov. TYPE: Peru. Loreto: Maynas, Iquitos, Allpahuayo, Estación Experimental del Instituto de Investigaciones de la Amazonía Peruana (IIAP), 04°10′S, 73°30′W, 150–180 m, 18 Jan. 1991 (fl), *R. Vázquez 15853* (holotype, MO 4069962; isotype, AMAZ). Figure 1.

Haec species a congeneribus pubescentia adpresso-puberula, inflorescentia fasciculata reducta bracteis linearibus 4–8 mm longis munita ac lobulis calycinis linearibus 4–8 mm longis distinguitur.

Shrubs or subshrubs flowering at 0.5 m tall, to 4 m tall; stems terete, densely appressed-pilosulous sometimes becoming glabrescent with age. *Leaf blades* elliptic, 7.5–15 cm long, 1.5–8 cm wide, at apex acute to acuminate with slender tips 8–15 mm long, at base acute, papyraceous, sparsely to moderately appressed-pilosulous on lamina above and below and similarly but more densely so on costa and secondary veins on both sides; secondary veins 8–12 pairs, usually looping to interconnect, without or with 1(–2) intersecondary veins present between pairs of secondary veins, without domatia, the costa and secondary veins plane to thickened above and prominulous below; *petioles* densely appressed-pilosulous, 3–23 mm long; *stipules* in bud ovoid, deltoid to rounded, persistent or falling off before the leaves, leaving a truncate remnant, moderately to densely appressed-pilosulous, becoming glabrescent and indurate with age, 1.5–3.5 mm long, entire to somewhat erose, enclosing colleters 0.5–2 mm long. *Inflorescences* terminal, congested to somewhat open, densely appressed-pilosulous, peduncles 1–3, fasciculate, 2–8 mm long, the flowers 1–3 on each peduncle, sessile, bracts 2–4 per flower, narrowly triangular to linear, appressed-pilosulous, acute, 4–8 mm long; *flowers* with hypanthium cylindrical to ellipsoid, densely appressed-pilosulous to -pilose, ca. 1.3 mm long; *calyx* limb densely appressed-pilosulous, with tube 1.8–2 mm long, lobes 4, linear, 4–8 mm long, acute; *corollas* salverform, in bud yellow-green to whitish, externally densely appressed-pilosulous, tubes ca. 12 mm long, lobes 4, narrowly triangular to lanceolate, ca. 13 mm long, acute; style ca. 9 mm long, stigmas 2, linear, ca. 3 mm long. *Fruits* ellipsoid to obovoid, 11–13 mm long, 7–9 mm diam., appressed-pilosulous, white, probably spongy; seed solitary, ellipsoid.

*Distribution, habitat, and phenology.* Amazonian Colombia and Peru, in terra firme forest at 100–180 m. Collected in flower in January and October, in fruit January through September.

This species is distinguished by its densely appressed-pilosulous pubescence on the stems, leaves, stipules, and inflorescences; fasciculate and rather reduced inflorescences; externally appressed-pilosulous to -pilose corollas; numerous linear inflorescence bracts; and linear relatively long stipule lobes. The corollas are known only in bud; because in many species of *Coussarea* the flowers are nocturnal and the corolla tubes and sometimes also the lobes elongate markedly just before anthesis, the sizes given above are minimums, and no reliable estimate of the mature flower size can be made at present.

Although the stipules of this species may appear glandular-fimbriate, the condition that distinguishes *Rudgea*, the glands in *Coussarea linearis* are colleters borne internally to the stipules and exposed when the stipules fall, rather than glands attached to the stipule apices as in *Rudgea*. The placement of this species in *Coussarea* is indicated by the four-parted calyx limb and corolla, stipules that enclose the buds in an imbricated apically rounded conformation, and spongy white fruits containing one ellipsoid seed with a papyraceous testa, in con-

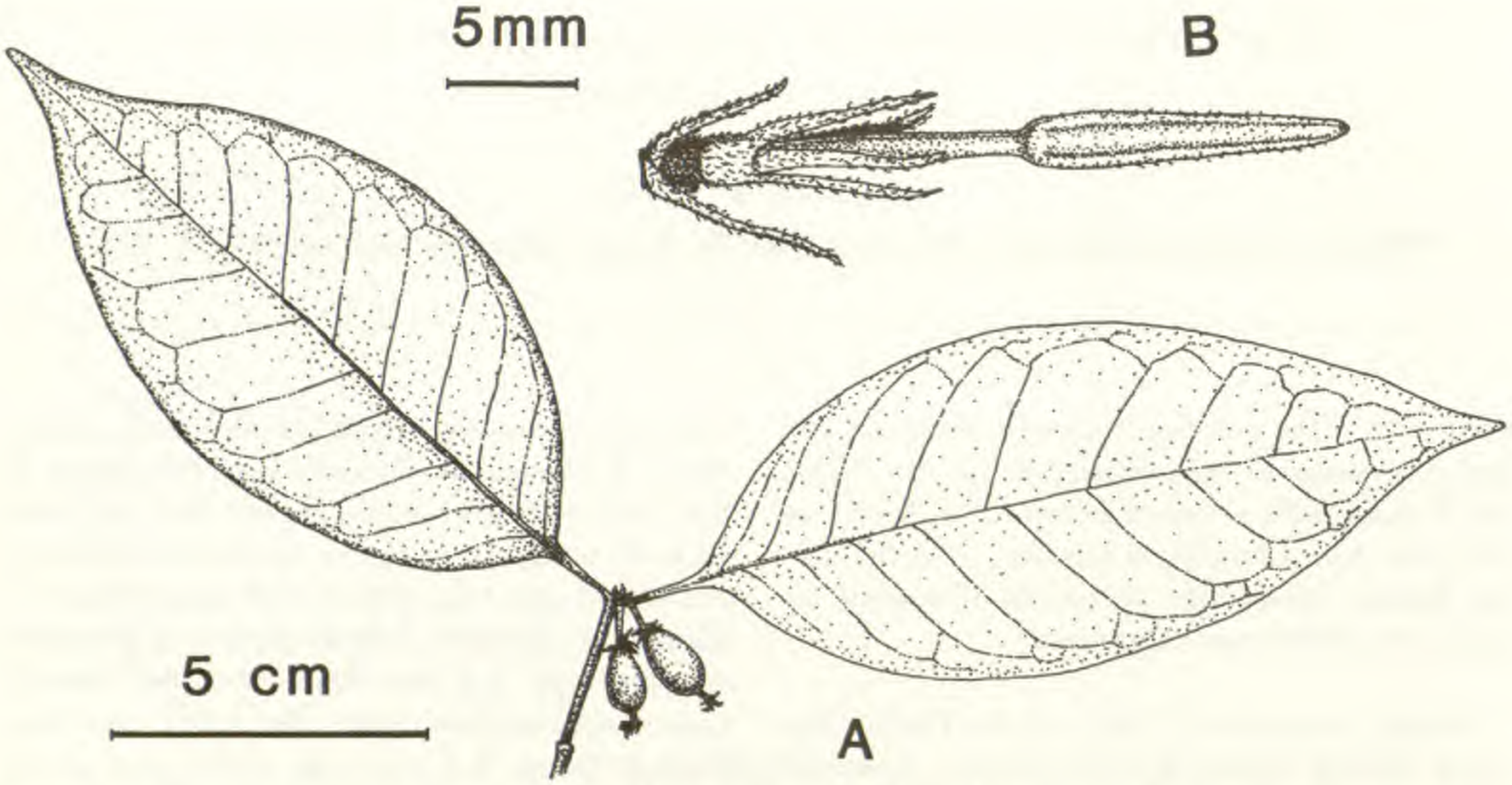


Figure 1. *Coussarea linearis* C. M. Taylor. —A. Habit. —B. Flower bud. A to 5-cm scale; B to 5-mm scale. A from *Vásquez & Jaramillo 16520* (MO); B from *Vásquez 15853* (MO).

trast to the usually five-parted calyx and corolla and fruits with two hard planoconvex pyrenes in *Rudgea* and *Psychotria,* and aristate or mucronate stipules with their apical projections usually crossed in *Faramea.*

This species can be confused with several other pubescent species of *Coussarea* with well-developed calyx lobes, in particular *C. flava* Poeppig & Endlicher, which also has subsessile and congested to subcapitate inflorescences, but which can be separated by its oblanceolate to narrowly elliptic leaves 8–28 cm long and 4–6.5 cm wide, and its stems and flowers with spreading pilosulous trichomes to 3 mm long; and *C. enneantha* Standley, with the calyx limb composed of a tube 4–12 mm long and narrowly triangular lobes 2–6 mm long, the stem and inflorescence pubescence spreading, the inflorescences branched at least once, and the bracts 3 mm long or shorter or sometimes lacking.

*Paratypes.* COLOMBIA. **Amazonas:** Parque Nacional Natural Amacayacu, near Tikuna village of Mocagua, 03°48′S, 70°18′W, *Gentry & Villa-Lopera 60830* (COL, MO); Parque Amacayacu, Centro Administrativo Amacayacu, *Pipoly et al. 15080* (COL, MO), *15117* (COL, MO); Parque Amacayacu, Centro Administrativo Mata-matá, *Pipoly et al. 15681* (COL, MO), *Rudas et al. 1297* (COL, MO), *1579* (COL, MO); Parque Amacayacu, *Vásquez et al. 12598* (AMAZ, MO). PERU. **Loreto:** Maynas, Iquitos, Allpahuayo, Estación Experimental del Instituto de Investigaciones de la Amazonía Peruana (IIAP), *Rueda & Rutz 648* (AMAZ, MO), *Vásquez & Jaramillo 16520* (AMAZ, MO), *Vásquez 16798* (AMAZ, MO).

**Palicourea macarthurorum** C. M. Taylor, sp. nov. TYPE: Colombia. Amazonas: Municipio de Leticia, Corregimiento de Tarapacá, Parque Nacional Natural Amacayacu, Cabaña Pamaté (extremo nor-occidental del Parque), trocha que sale de la cabaña, paralela al Caño Pamaté, 03°11′S, 70°20′W, 100 m, 1 July 1991 (fl), *A. Rudas et al. 2725* (holotype, COL; isotype, MO). Figure 2.

Haec species a *Palicourea longiflora* (Aublet) L. C. Richard foliis utrinque glabris, pedunculo 0.5–3 cm longo, inflorescentiae bracteis reductis, corolla extus glabra ac fructu 10–11 mm longo distinguitur.

Shrubs to 3 m tall; stems glabrous, becoming terete. *Leaves* paired, *blades* elliptic to elliptic-oblong or somewhat ovate, 10–16 cm long, 2.8–6 cm wide, at apex acute to often acuminate with slender tips 1–2 cm long, at base acute to usually cuneate, papyraceous, glabrous throughout; secondary veins 7–12 pairs, looping broadly to interconnect, with 1–2 weak intersecondary veins usually present between pairs of secondary veins, costa and secondary veins thickened to prominulous above and below, the lesser venation sometimes slightly thickened; *petioles* glabrous, 8–12 mm long; *stipules* glabrous, united around the stem into a low continuous sheath 0.5–1 mm long, entire, broadly concave, interpetiolarly bilobed, lobes deltoid to ligulate, obtuse to rounded, 0.8–1.5 mm long, entire. *Inflorescences* corymbiform, erect; peduncles 0.5–3 cm long; panicles 2–4 cm long, 3–4.5 cm wide, with 1

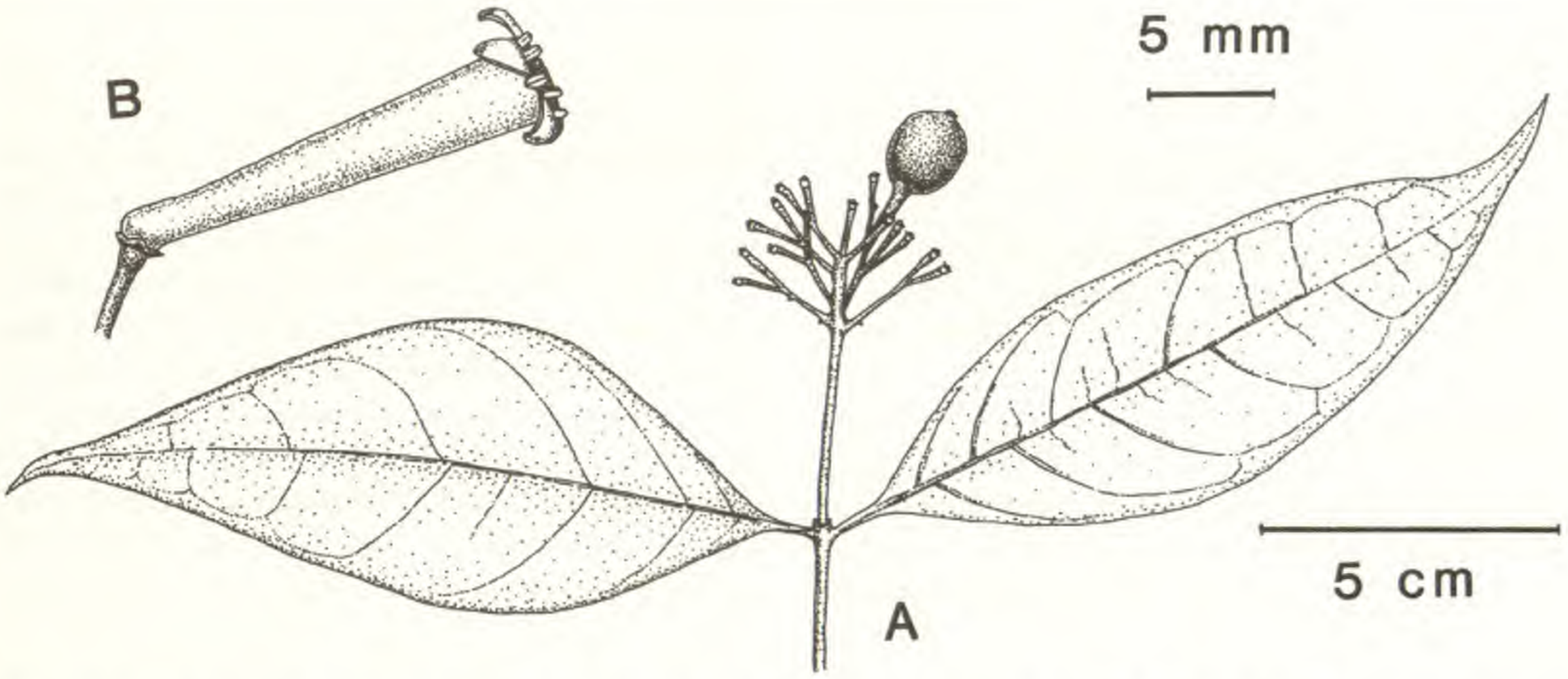


Figure 2. *Palicourea macarthurorum* C. M. Taylor. —A. Habit. —B. Flower bud. A to 5-cm scale; B to 5-mm scale. A from *Rubio 94* (MO); B from *Rudas et al. 2725* (MO).

pair of weakly developed lateral branches, these and pedicels ascending, with flowers pedicellate in open cymules of 2–5 or occasionally one flower per cymule subsessile; bracts rudimentary or lacking, those subtending larger branches usually displaced from the branching point, 0.2–0.5 mm long, rounded; pedicels 0.5–11 mm long; peduncle, axis, branches, bracts, and pedicels glabrous to minutely puberulous, yellow; *flowers* with hypanthium ca. 1 mm long, cylindrical to turbinate, minutely puberulous; *calyx* limb ca. 0.3 mm long, puberulous, broadly shallowly lobed, ciliolate; *corollas* funnelform, yellow, swollen and gibbous at base, strongly bent here but generally straight in the tube, glabrous externally, internally glabrous except for a densely pilose ring 1–1.5 mm wide just above the basal swelling, tube ca. 17 mm long, ca. 1.5 mm diam. just above the pilose ring, ca. 3 mm diam. at mouth, lobes narrowly triangular, ca. 3 mm long, acute and slightly thickened at apex; disk ca. 0.8 mm high. *Infructescences* similar in size to inflorescences, the branches and pedicels often more spreading, becoming red; *fruits* ellipsoid, 11–13 mm long, 10–12 mm wide, laterally somewhat flattened, glabrous; *pyrenes* with 3–5 broadly angled low ridges.

*Distribution, habitat, and phenology.* Amazonian Colombia and Ecuador, in wet forest at 100–1200 m. Collected in flower March, April, and July, in fruit April and November.

This species is distinguished within *Palicourea* by its relatively small stipules, short corymbiform inflorescences with well-developed pedicels and rudimentary bracts, yellow and externally glabrous corollas, and distinctive, large fruits with the pyrenes nearly smooth. The fruit color is unknown but those of most *Palicourea* species are blue-black. This species is similar to *P. longiflora* (Aublet) L. C. Richard, which is common further east in Amazonia and can be distinguished by its leaves puberulous to pilosulous abaxially, inflorescences with 2–3 pairs of lateral branches and bracts 0.5–7 mm long borne on peduncles 2.5–10 cm long, corollas puberulous externally, and fruits 4–5 mm long and 5–6 mm wide with the pyrenes distinctly and sometimes rather sharply longitudinally ridged.

The specific epithet commemorates John D. and Catherine T. MacArthur, whose foundation has sponsored floristic inventories of several important sites in Amazonian Peru and Colombia, including the Parque Amacayacu.

*Paratypes.* COLOMBIA. **Amazonas:** Municipio de Leticia, Parque Nacional Natural Amacayacu, *Pipoly et al. 15319* (COL, MO), *15299* (COL, MO), *15353* (COL, MO), *15902* (COL, MO), *Rudas et al. 3442* (COL, MO). **Putumayo:** Vereda Medio Afán, camino Medio Afán–Churumbelo, ca. 2.5 horas de Mocoa hacía el oriente, *García et al. 64* (CUVC, MO). ECUADOR. **Morona-Santiago:** Cordillera Cutucú, toward the Itzintza, ca. 02°40′S, 78°W, *Camp E-1352* (S). **Napo:** carretera Hollín–Loreto, Km 40, 00°43′S, 77°36′W, *Hurtado et al. 208* (MO, QCNE), carretera Hollín–Loreto, Km 40–50, *Hurtado 550* (MO, QCNE). **Pastaza:** vía Auca, 115 km al sur de Coca, cerca del río Tigüino, carretera de PETRO-CANADA en construcción, 01°15′S, 76°55′W, *Rubio 94* (MO, QCNE).

**Palicourea quadrifolia** (Rudge) de Candolle, Prodr. 4: 529. 1830.

Steyermark (1972: 760) presented synonymy and a discussion of this species.

KEY TO THE SUBSPECIES OF *PALICOUREA QUADRIFOLIA*

1. Leaves quadrate; floral bracts narrowly triangular to linear, 0.2–0.5 mm wide; Guyana, French Guiana, Venezuela, Brazil, southern Peru (Madre de Dios) . . . . . subsp. *quadrifolia*
1. Leaves paired; floral bracts narrowly triangular to elliptic, 0.3–1.2 mm wide; Colombia, northern Peru (Loreto) . . . . . subsp. *leticiana*

**Palicourea quadrifolia** subsp. **leticiana** C. M. Taylor, subsp. nov. TYPE: Colombia. Amazonas: Municipio de Leticia, Corregimiento de Tarapacá, Parque Nacional Natural Amacayacu, Cabaña Lorena (Río Cothué), 03°02′S, 70°00′W, 100 m, 24 June 1991, *A. Rudas et al. 2437* (holotype, COL; isotypes, MO 3933506, MO 4258973).

*Palicourea lucentifolia* Standley, Publ. Field Columbian Mus., Bot. Ser. 8: 223. 1930. Syn. nov. TYPE: Peru. Loreto: La Victoria on the Amazon River, 29 Aug. 1929, *L. Williams 2906* (holotype, F 604457).

Haec varietas a varietate typica foliis binatis ac bracteis floralibus ex linearibus anguste ellipticis 0.3–1.2 mm latis differt.

Flowering at 1.5 m tall, to 5 m tall; stems glabrous to sparsely puberulous. *Leaves* paired, with *blades* narrowly elliptic to elliptic, 10.5–35 cm long, 3–11.5 cm wide, acute to usually acuminate at apex with slender tips 5–28 mm long, cuneate to usually acute and sometimes tapering at base, papyraceous, glabrous and usually shiny above, glabrous to minutely puberulous below; secondary veins 11–28 pairs, sometimes looping to interconnect distally or usually uniting with the margin, usually with 1–3 weak intersecondary veins between each pair of secondary veins; *petioles* glabrous to sparsely puberulous, 3–15 mm long; *stipules* glabrous to sparsely puberulous, united around the stem into a triangular to truncate continuous sheath 2–6 mm long, enclosing and often exceeded by colleters and appearing ciliate, sometimes splitting to base, interpetiolarly bilobed, the lobes triangular to usually subulate, 0.5–3 mm long. *Inflorescences* corymbiform, flat-topped to broadly rounded, erect; peduncles 4–11.5 cm long, subtended by a truncate stipule sheath that lacks leaves or bears reduced leaves and terminates a reduced or unexpanded internode; panicles 4.5–9 cm long, 6–12 cm wide, lowermost branches paired, ascending; flowers sessile in congested to open and dichasial cymules of 3–7, each subtended by 1–2(–3) bracts, these free or slightly fused, linear to narrowly elliptic, acute, 1.2–3 mm long, 0.3–1.2 mm wide, ciliolate, on principal branches the bracts absent or displaced markedly from the branching nodes; peduncle, axis, branches, and bracts yellow, minutely puberulous to pilosulous with trichomes ca. 0.1–0.3 mm long; *flowers* distylous, with hypanthium moderately to densely puberulous, turbinate to hemispherical, 0.3–0.5 mm long, *calyx* limb densely puberulous, subtruncate to dentate, ca. 0.2–0.3 mm long; *corollas* tubular, yellow, externally glabrescent to densely puberulous and usually sparsely hirtellous on lobes, shortly swollen at base, generally straight there and in tube, internally glabrous except for a densely villous ring ca. 1.5 mm wide just above the basal swelling, tubes 8–12 mm long, 2.5–3 mm diam., lobes triangular to deltoid, 1–2 mm long; disk ca. 0.5 mm high. *Infructescences* similar in size and proportion to inflorescences or sometimes more expanded with the branches spreading more widely, becoming orange to red; *fruits* ellipsoid, ca. 3 mm long, ca. 5 mm wide, somewhat didymous, glabrescent; *pyrenes* 2, hemispherical to subglobose, smooth.

*Distribution, habitat, and phenology.* Amazonian Colombia and Peru, in wet forest at ca. 100 m. Collected in flower in June and August to September.

*Palicourea quadrifolia* subsp. *leticiana* differs from subspecies *quadrifolia* only its paired rather than quadrate leaves and wider floral bracts; otherwise it falls within the range of variation seen in the latter subspecies. Paired leaves are occasionally found in some verticillate-leaved species (see descriptions in Steyermark, 1974), and may become fixed in local populations, as in *P. triphylla* de Candolle in Cuba (Taylor, 1993). This feature, together with the consistently relatively broad floral bracts, suggests that the plants segregated here as subspecies *leticiana* are isolated from more eastern and southern populations of *P. quadrifolia*. The lack of any observable difference in reproductive characteristics between these two morphological forms and their complementary geographic ranges suggest that subspecific status is more appropriate than varietal or specific recognition. The epithet refers to the geographic area from which these plants were first known.

Standley described *Palicourea lucentifolia* based on a single specimen that was collected in the stage in which the corollas have all fallen and no fruit development is evident. Because conclusive identification of *Palicourea* species is based on corolla characteristics, it is preferable to have a type specimen that bears mature flowers, as does *Rudas et al. 2437*, which also has several duplicates.

*Paratypes.* COLOMBIA. **Amazonas:** municipio de Leticia, Parque Nacional Natural Amacayacu, *Rudas et al. 2352* (COL, MO); Río Amazonas, vicinity of Leticia, *Schultes et al. 24023* (ECON, MO), *24032* (ECON). **Caquetá:** Florencia, cerro de La Sardina, *Cuatrecasas 8891* (COL).

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Literature Cited

Steyermark, J. A. 1972. *Palicourea. In*: B. Maguire & Collaborators, Flora of the Guayana Highlands. Mem. New York Bot. Gard. 23: 717–777.

———. 1974. *Palicourea. In*: T. Lasser (editor), Flora de Venezuela 9: 1683–1830. Instituto Botánico, Dirección de Recursos Naturales Renovables, Ministerio de Agricultura y Cría. Caracas, Venezuela.

Taylor, C. M. 1993. Revision of *Palicourea* (Rubiaceae: Psychotrieae) in the West Indies. Moscosoa 7: 201–241.

# *Inga megaphylla* (Leguminosae, Mimosoideae), a New Species from Western Amazonia (Colombia, Peru), with Comments on Architectural Features Unusual in the Genus *Inga*

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ABSTRACT. A new species of *Inga*, discovered by one of the authors (HV), is described and named as *Inga megaphylla* Poncy & Vester. The architecture of this small understory cauliflorous tree is described and compared with that of another understory species recently described from French Guiana, *Inga retinocarpa* Poncy.

**Inga** (sect. *Inga* ser. *Pilosulae*) **megaphylla** Poncy & Vester, sp. nov. TYPE: Colombia. Amazonas: Río Caquetá, Araracuara, 16 Oct. 1990 (fl), *Vester, Castro & Cleef 126* (holotype, P; isotype, COAH). Figures 1–8.

Arbor parva, foliis amplis, foliolis (2–)3–4(–5)-jugis, rachide alata. Inflorescentiae spicatae, cauliflorae, floribus pubescentibus. Calyx irregulariter fissus; corolla ca. 14 mm longa; tubus staminalis exsertus. Legumen rectum, glabrum, seminibus prominentibus.

Treelet, the fertile plants collected 6–10 m high, with a trunk 3–9 cm diam.; bark light gray, scarcely lenticelled. Young twigs rusty pubescent. Leaves very large, pinnate with (2–)3–4(–5) pairs of leaflets. Stipules early caducous, seen on the seedling only. Petiole 7–10(–15) cm long, thick (up to 8 mm diam.) terete at length or distally narrowly winged, glabrous or slightly tomentose, lignified on old leaves. Segments of the rachis 6–10 cm each, winged, oblong, up to 2 cm wide, the main nerve tomentose on both faces. Nectaries orbicular, 12 mm diam. Leaflets elliptic and almost symmetrical, those of the proximal pair ca. 16 × 6 cm, of the distal one up to 40 × 15 cm; base acute to cuneate, apex acute to obtuse, acuminate. Inflorescence a cauliflorous spike, arising from the trunk or older lateral branches up to 6–10 m from the ground, solitary or fascicled in the axil of prominent and large (ca. 1.5 cm) triangular leaf scars; peduncle slender, 1.5–5(–7)cm long; rachis 1.5–2 cm long; bracts (very few seen) caducous, or if persistent inconspicuous (1 mm long), rigid, scaly; flowers pedicellate, pedicel ca. 1.5 mm long; calyx funnelform, yellowish, very light-rusty, 6–7 mm long, irregularly cleft, glabrous to lightly pubescent, and more so on the margins of the teeth, these acute, ca. 2 mm long; corolla pale yellowish green, 13–14 mm long, covered with dense appressed shiny hairs, the lobes acute ca. 2.5 mm long; androecium white, the staminal tube exserted, up to 17 mm long, the free part of the filaments ca. 30 mm; bases of the staminal tube and corolla fused in a 2-mm-long stemonozone; nectariferous dots are visible inside the staminal tube at its base, surrounding the base of the ovary. Ovary glabrous, ovules 20–24 (4 flowers dissected). Pod straight, hanging, 15–20(–22) cm × ca. 1.7 cm, glabrous; the sutures slightly prominent, 2–3 mm wide, the valves transversally rippled, dark green at maturity, the seeds not contiguous, prominent. Seeds 14–16 (26 for the specimen from Peru), 1.5 × 7.8 mm, the tegument a white edible pulp, the cotyledons bright black. Seedling: epicotyl 4 cm; first leaves opposite, bifoliolate (i.e., with one pair of leaflets), the petiole ca. 0.5 cm; next leaves alternate with a longer and winged petiole, the first 2–5 next ones also bifoliolate, then with two, then three pairs of leaflets; axis, terminal bud, and veins green tomentose; stipules ca. 0.5 cm long, linear.

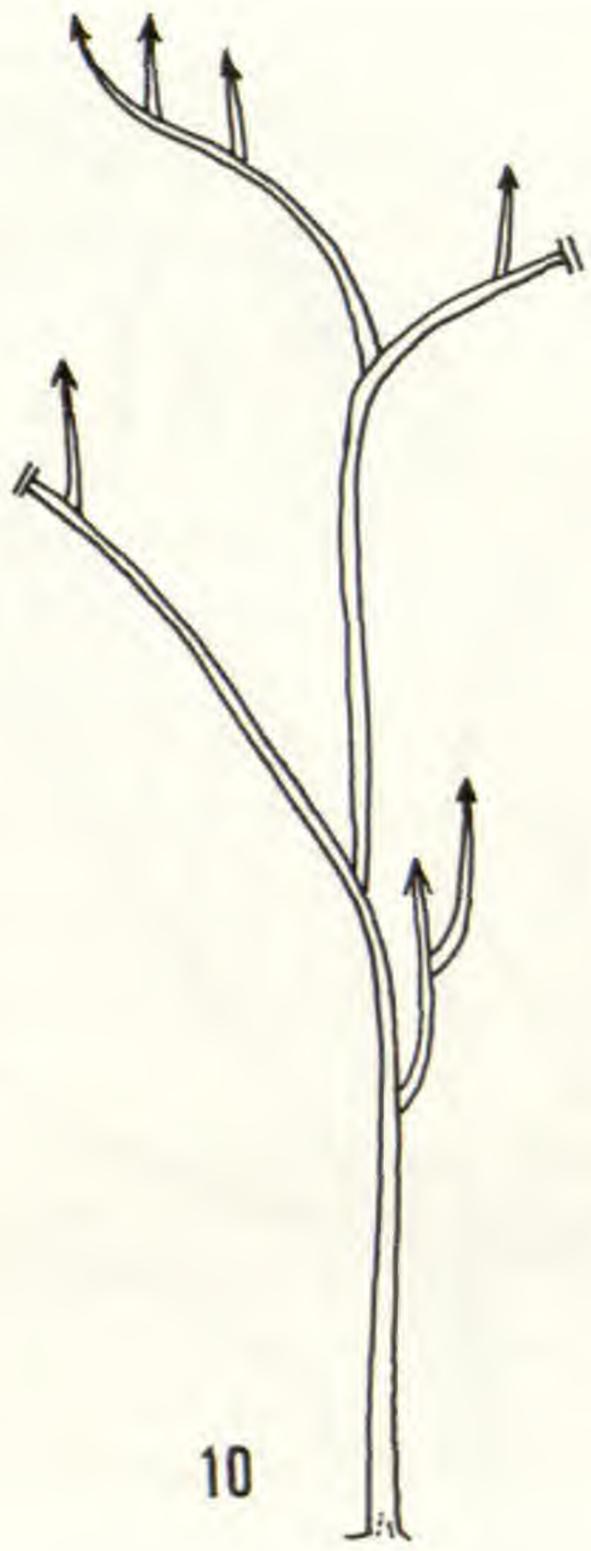
The specific epithet refers to the very large leaves.

*Distribution.* Lowland rainforest of western Amazonia (southern Colombia and northern Peru).

*Local name.* Jiteinicoai (huitoto).

*Inga megaphylla* is referable to series *Pilosulae*

Figures 1–8. *Inga megaphylla* Poncy & Vester. —1. Leaf. —2. Inflorescence. —3. Fruit. —4. Flower. —5. Longitudinal section of the base of the flower, the ovary removed, the calyx dotted, the corolla, staminal tube, and stemonozone hatched. —6. The dorsifixed anther, lateral and vertical views. —7. Stigma. —8. Seedling (only one leaf of the first opposite pair of leaves is drawn).



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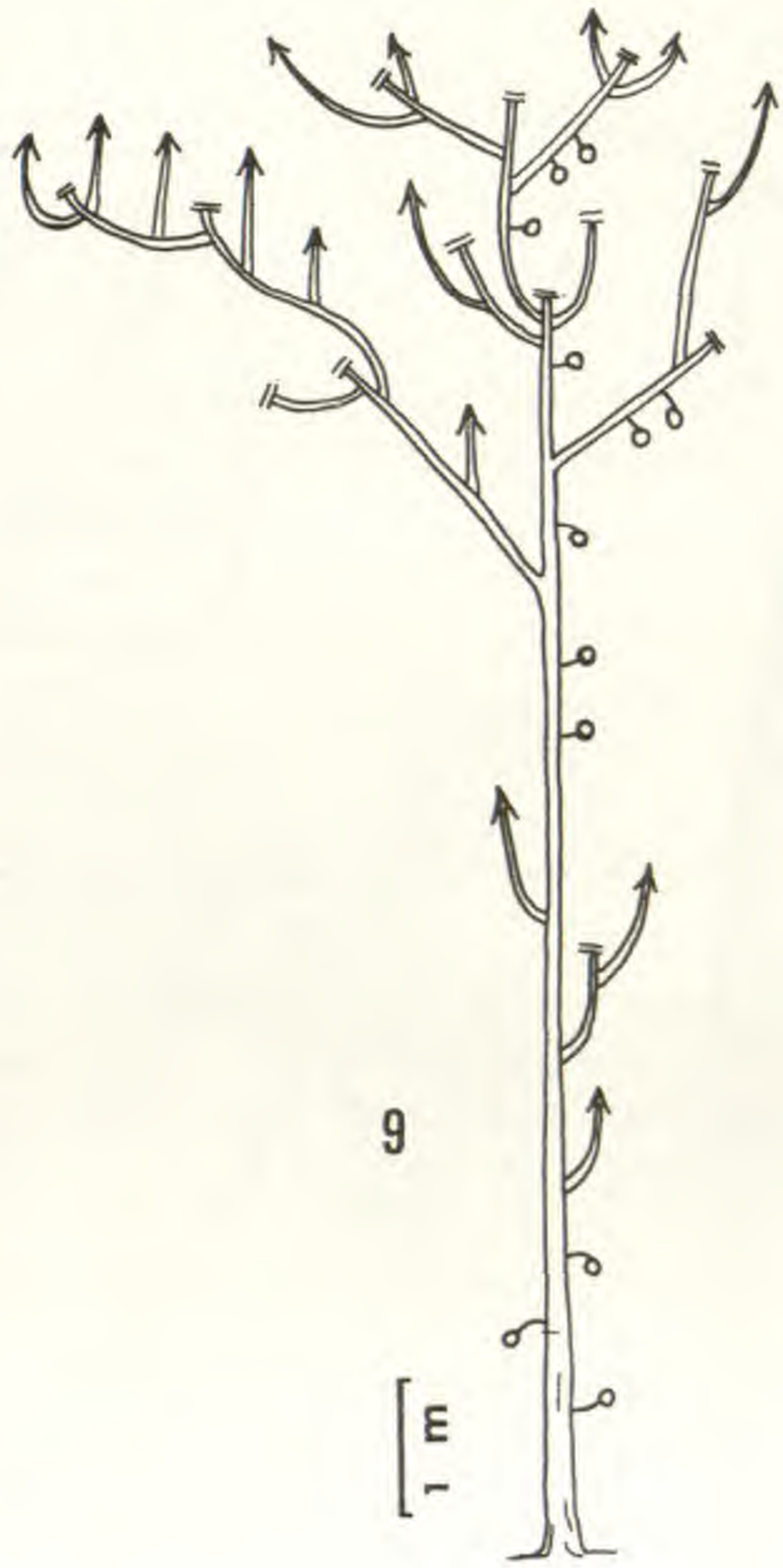

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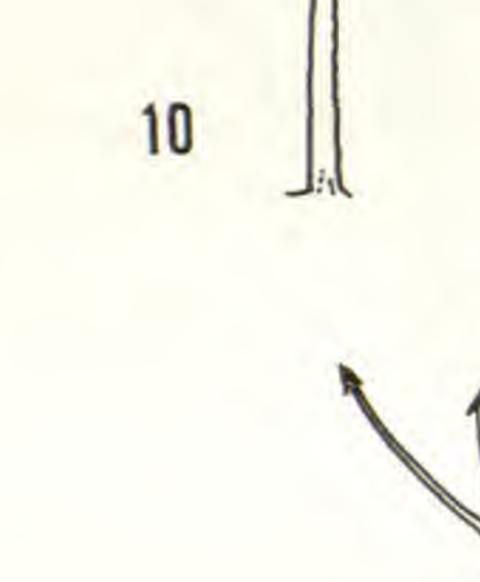


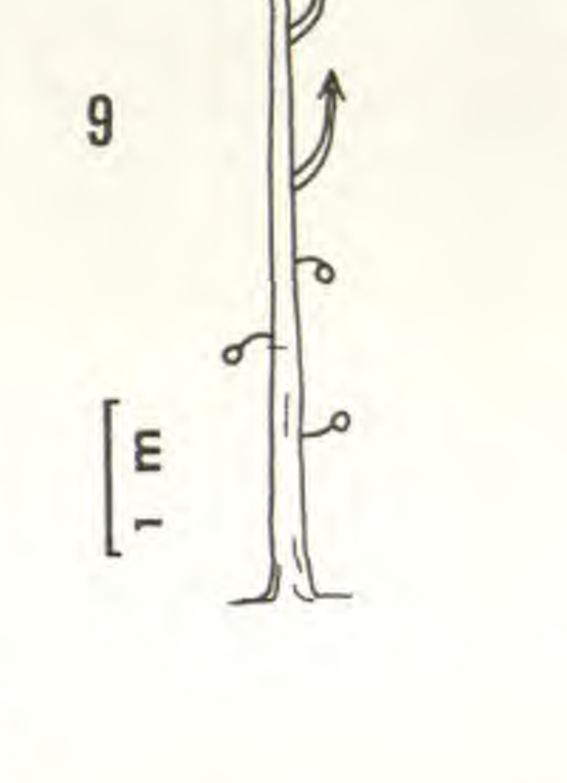


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Figures 9–12. Architecture of *Inga megaphylla* (9, 10) in Colombia and *I. retinocarpa* (11, 12) in French Guiana. — 9. *Inga megaphylla*, branching pattern of a ca. 10-m-high tree. —10. Schematic architectural pattern drawn from observation of several individuals. —11. *Inga retinocarpa*, branching patterns of an individual 5.50 m high. —12. Habit of an individual 3.50 m high: all leaves are represented; branching was sylleptic although the primary axis continues living without developing further.

of section *Inga*. Its floral characters suggest affinities with *I. splendens* Willdenow, which, however, has sessile flowers and a larger calyx.

*Inga megaphylla* is an understory, cauliflorous treelet with very large leaves that simulate lateral branches. Its architecture can be described as follows (Figs. 9, 10): main axis unbranched or sparsely branched often up to 4 m high; branches orthotropic like the main axis; branching not rhythmic or not clearly so; sylleptic branching very scarce and only one branch at a time; most branching proleptic. The individual illustrated in Figure 9 exhibits these features, while Figure 10 integrates all the observations made. The architectural model must be related to Champagnat's model (Hallé & Oldeman, 1970; Hallé et al., 1978), although the axes do not bend in the way suggested in the definition of that model. In a somewhat open undergrowth with more light available, the trunk and branches can be slender and bending.

The habit of our new species can be compared with that of another understory, cauliflorous species described from French Guiana, *Inga retinocarpa* Poncy (Poncy, 1991). This species appears to be quite common around the Field Research Station "Les Nouragues" (French Guiana), near the Arataye River, where the type specimen was collected. This is also a small tree, although it seems to reach a greater size than *I. megaphylla*. However, small individuals only 4 m high consisting of one orthotropic, very scarcely branched primary axis can be fertile. All samples observed have orthotropic lateral branches with spirally arranged leaves (Figure 12). Branching is mainly sylleptic, and as in *I. megaphylla* not clearly rhythmic, but certainly not continuous. The result of this sylleptic branching is that *I. retinocarpa* forms a broader crown. The basic architectural model is nevertheless difficult to determine for such plants in very constraining living conditions. The species is now grown in the nursery of the camp, but only the early stages have been observed; indeed, *I. retinocarpa* seems to grow extremely slowly, so that trees of 5 cm diameter could be several decades old.

Such architectural features are surprising in a genus where so many species exhibit the same Troll's model (Poncy, 1985). *Inga megaphylla* and *I. retinocarpa*, which are remotely allopatric and not closely related taxonomically, seem, however, to have adapted in very similar ways to understory conditions.

*Paratypes.* COLOMBIA. **Caquetá:** Río Caquetá, Araracuara, 2 Feb. 1991 (fr), *Vester & Castro 315* (COAH, P), 28 Sep. 1993 (fl), *Vester & Roman 805* (COL, COAH, P, AMD). PERU. **Loreto:** rio Yubineto, 15 Feb. 1978 (fr), *Barrier 668* (P).

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Literature Cited

Hallé F. & R. A. A. Oldeman. 1970. Essai sur l'architecture et la dynamique de croissance des arbres tropicaux. Masson, Paris.

———, ——— & P. B. Tomlinson. 1978. Tropical Trees and Forests: An Architectural Analysis. Springer-Verlag, Berlin.

Poncy, O. 1985. Le genre *Inga* (Légumineuses, Mimosoideae) en Guyane française: Systématique, morphologie des formes juvéniles, écologie. Mém. Mus. Natl. Hist. Nat. (Paris), sér. B, Bot. 31: 1–124.

Poncy, O. 1991. Deux nouvelles espèces de *Inga* (Mimosaceae), et notes nomenclaturales et taxonomiques sur trois autres espèces. Bull. Mus. Hist. Nat. (Paris), 4e sér., 13, sect. B, Adansonia, 3–4: 147–154.

# *Encephalartos imbricans* (Zamiaceae): A New Species from Uganda

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ABSTRACT. *Encephalartos imbricans,* a new species from Uganda, is described, illustrated, and circumscribed in terms of other tropical African arborescent species. It is a large arborescent plant, with leaflets mostly strongly incubously overlapping. The strobili are green and glabrous; the megastrobilus is ovoid, shortly pedunculate, with the surfaces of the bullae wrinkled; the microstrobili emerge in succession, being narrowly ovoid, long-pedunculate, with the surfaces of the bullae smooth.

*Encephalartos* is widespread in the eastern parts of Africa, from the Eastern Cape Province of South Africa to southern Sudan, extending westward through equatorial Africa to Ghana and Nigeria (Goode, 1989: 244; Fig. 1). Nowhere is it common; it occurs mostly as relic populations, of which a considerable percentage must be considered to be in danger of extinction. The description of *E. imbricans* brings the number of described and recognized taxa to 57.

**Encephalartos imbricans** Vorster, sp. nov. TYPE: Uganda. Near northern shore of Lake Victoria, Oct. 1994, *P. Heibloem sub P. Vorster 3034* (holotype, K). Figures 2–5.

Planta magna arborescens. Foliola plerumque valde incuba, minime leviter falcata, dentibus in marginibus ambobus ad spationibus 25–50 mm et dentibus 3–4 confertis concentratis ad basin marginis superioris. Strobili virides, glabri, bullarum porcis mediolateralibus integris; megastrobili ovoidei, breve pedunculati, bullarum faciebus radialiter rugosis; microstrobili in successione emergentes, anguste ovoidei, longe pedunculati, bullarum faciebus laevigatis.

Large arborescent, unbranched plant; suckering profusely from base. Stem up to 6 m long, prostrate after 1.5–2.0 m from base, 400–650 mm diam., covered with old leaf bases. Fronds numerous, spreading, straight, emerging fresh medium green and maturing to dark glossy green, about 2(–3.5) m long, leaflets gradually reduced to prickles toward proximal part of petiole to leave no prickle-free petiole; median leaflets orientated at angle of about 45° with rachis toward apex of frond, opposing leaflets are in the same plane as seen in cross section of leaf, very narrowly ovate and very slightly falcate, with teeth 25–50 mm apart on both margins and often 3–4 closely spaced teeth near base of upper margin, mostly strongly incubously overlapping, 200–250 mm long and up to 22 mm wide. Megastrobili 2–3, ovoid with apical sporophylls sterile, shortly pedunculate with exposed peduncle 30–40 mm long, glaucous green, glabrous, about 300 mm long and 180 mm diam.; bullae of sporophylls moderately projecting, terminal facet centrally situated and about ⅓ the horizontal diameter of bulla, median facet differentiated in most sporophylls, ridges separating facets clearly differentiated and simple, terminal facet smooth but other facets radially rugose. Microstrobili 5–8, emerging and maturing in succession, each carried on a stout peduncle up to 300 mm long; strobili glaucous green, glabrous, about 300 mm long and 90 mm diam. at maturity; bullae of sporophylls moderately projected, slightly drooping, only terminal facet differentiated and about ⅓ the horizontal diameter of bulla, smooth. Seed covered with orange (not red) sarcotesta, about 45–50 mm long and 25–30 mm wide; with sarcotesta removed about 40 mm long and 18–24 mm wide.

*Variation.* A concentration of 3 to 4 closely spaced teeth near the base of the upper margin is present in most (Fig. 2B), but not all (Fig. 3), leaflets. Likewise, the majority of plants have strongly overlapping leaflets; but through a quirk of fate the frond collected for the type specimen has well-spaced leaflets—it probably developed in a situation where it was shaded by other plants and thus became etiolated.

*Phenology.* During October the plants had fresh male and female cones, and seeds from the previous season were scattered about. A mature megastrobilus collected at this time disintegrated in mid-November, suggesting that the megastrobili take slightly more than a year to mature.

*Geographical distribution and habitat.* Known

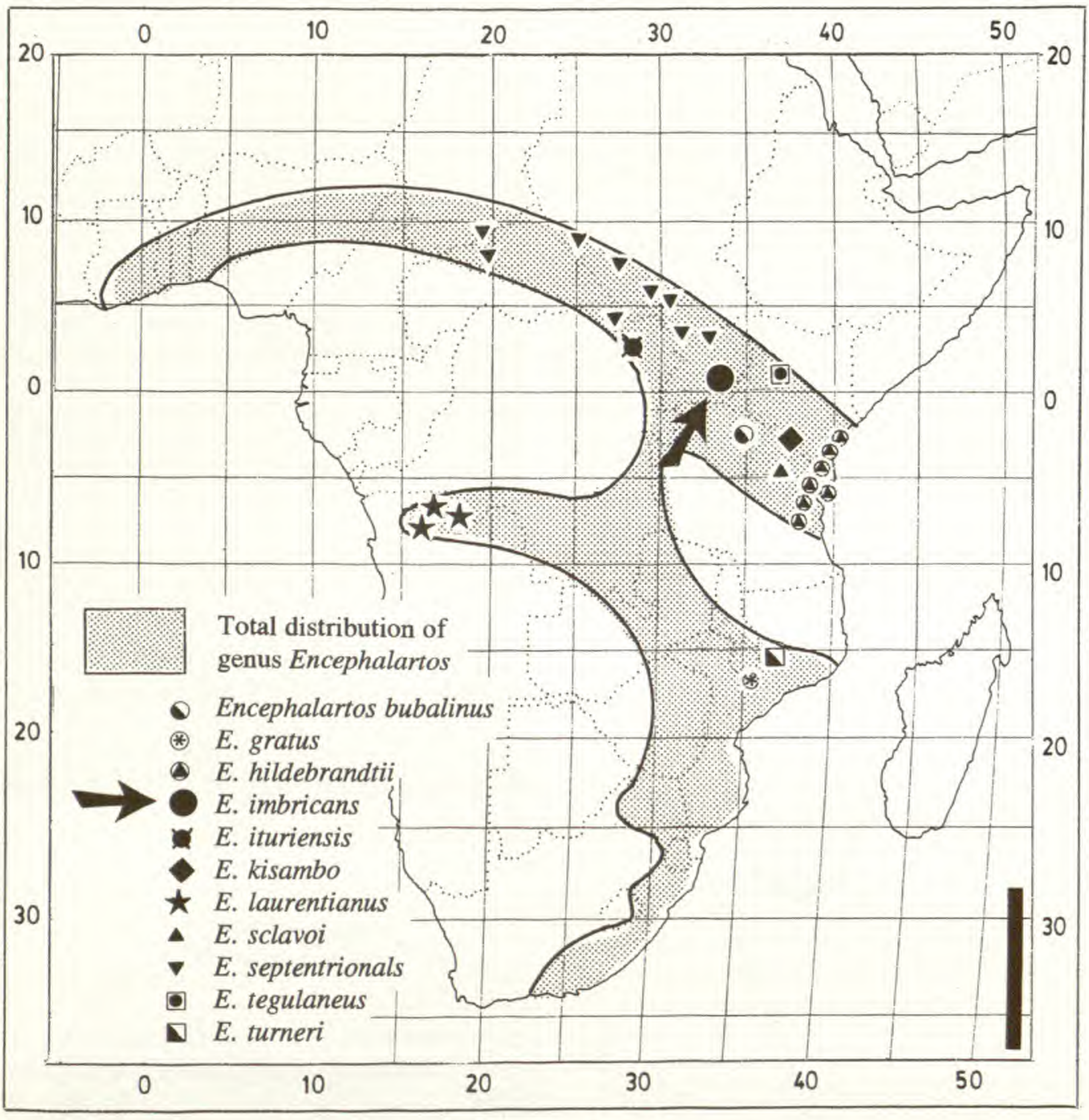



Figure 1. *Encephalartos imbricans* Vorster. Known geographical distribution in relation to distributions of other tropical African arborescent species. Based on Stevenson et al. (1990b) and Goode (1989). Scale bar = 1000 km.

only from two populations on the northern shore of Lake Victoria, where it occurs on two adjacent low hills in otherwise fairly flat country (Fig. 1). It grows on bare granite outcrops, wedged in crevices from which the plants cannot escape, in minimal soil, and under intense insolation. These outcrops (Fig. 6) have minimal vegetation, yet the charred trunks of *Encephalartos imbricans* testify that the plants are subject to periodic burning, and suitable niches for seedling establishment must be very scarce.

*Conservation status.* The population visited consisted of about 300 individuals. It appeared to be vigorous and was coning, yet no young plants or evidence of seedling regeneration were seen. It seems likely that the number of plants is in equilibrium with the limited extent of the specialized habitat. Seed dissected contained no embryos, and no insects that could be suspected of being pollen vectors were found in either male or female strobili. We therefore conclude that these populations are vulnerable to overcollecting, and, accordingly, the precise locality is not made public.

*Affinities.* Within *Encephalartos*, interspecific relationships are still poorly understood. For many years species were separated solely on vegetative characteristics (Vorster, 1993). There does indeed seem to be a considerable amount of convergence

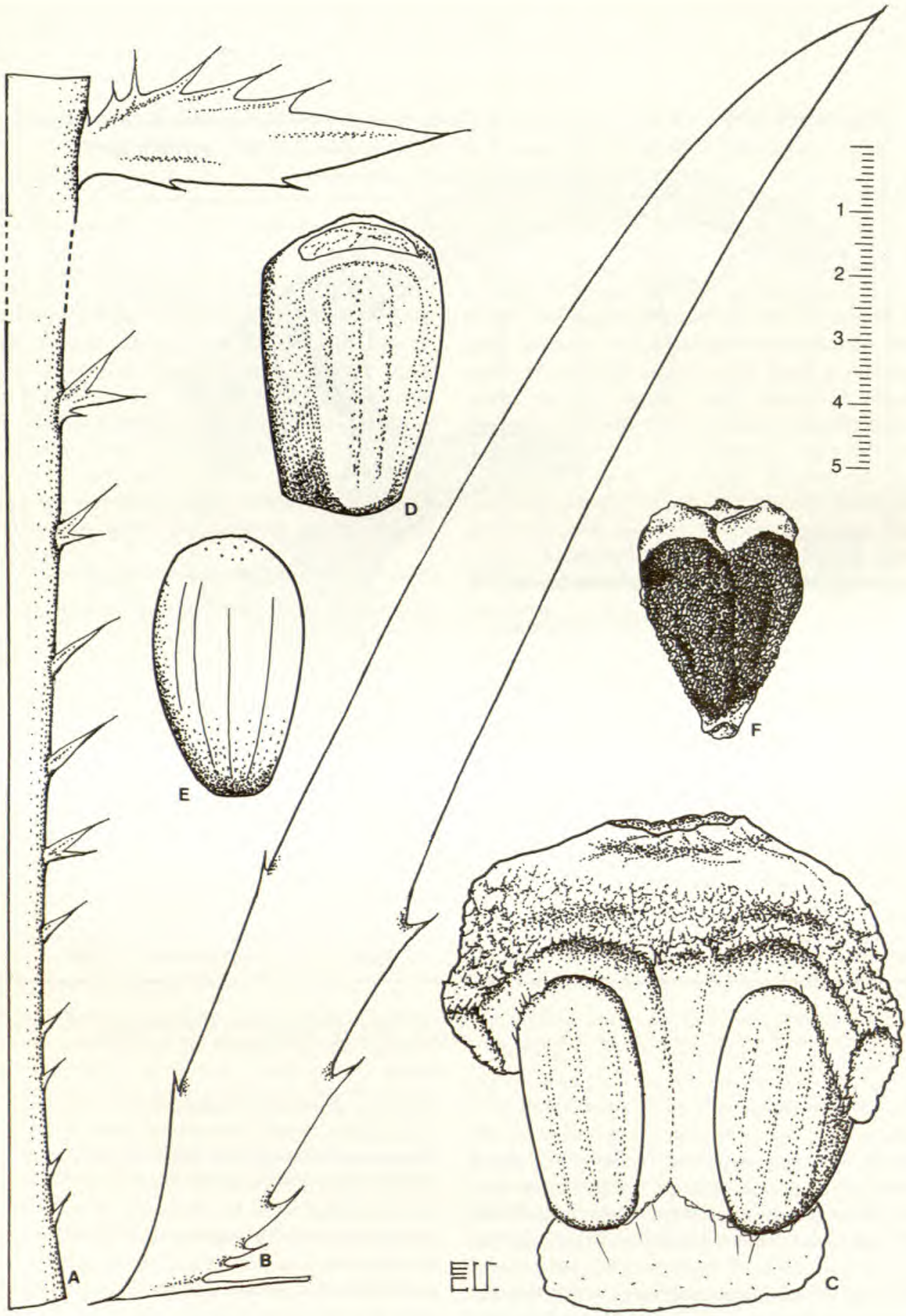



Figure 2. *Encephalartos imbricans* Vorster. —A. Proximal part of petiole. —B. Median leaflet. —C. Megasporophyll in ventral view. —D. Seed with sarcotesta. —E. Seed with sarcotesta removed. —F. Microsporophyll in ventral view. Scale bar = 50 mm. (*Heibloem sub Vorster 3034.*)

Figure 3. *Encephalartos imbricans* Vorster. Part of median zone of frond, showing incubously overlapping leaflets. Scale bar = 100 mm. (Plant in habitat.)

in cone characteristics, yet these are often useful to circumscribe species, if not always reflecting phylogenetic relationships. It would appear that recurring vegetative characteristics may well be cryptic signposts of evolutionary kinship. The following is therefore intended to identify *E. imbricans*, but is certainly not intended to reflect phylogenetic relationships.

*Encephalartos imbricans* resembles *E. bubalinus* Melville (Melville, 1957) in its green, ovoid, shortly pedunculate megastrobili (Fig. 4E), but differs by the somewhat wrinkled instead of smooth facets of the megastrobilate bullae (Fig. 4F), and by the long-peduncled instead of almost sessile microstrobili. In both species the leaflets are overlapping, but in *E. imbricans* the leaflets taper gradually to their apices (Fig. 2B), whereas in *E. bubalinus* they are uncinate.

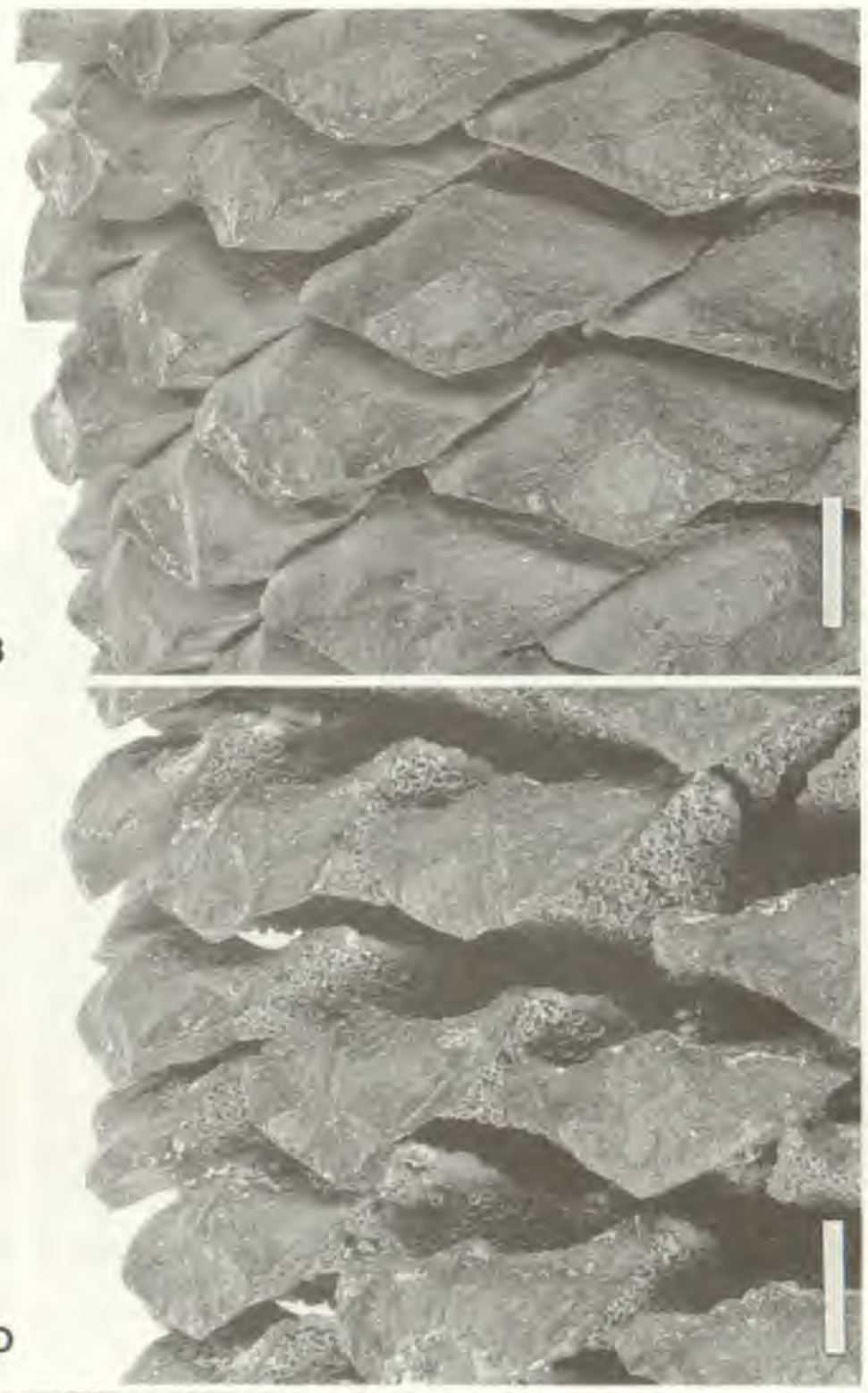
*Encephalartos imbricans* resembles an undescribed species from western Uganda in its green, ovoid megastrobili, but is readily distinguished by the somewhat wrinkled instead of smooth facets of the megastrobilate bullae, and the mostly strongly overlapping (Fig. 3) instead of well-spaced leaflets. The concentration of 3–4 teeth near the base of the upper leaflet margin was not seen in the western Ugandan species.

*Encephalartos imbricans* resembles *E. laurentianus* De Wildeman (De Wildeman, 1903a, b, c, 1907; Bois, 1907; Gentil, 1904a, b; Lebrun, 1930; Robyns, 1948) by its shortly pedunculate, ovoid megastrobili, of which the facets of the bullae are somewhat wrinkled, as well as by the large number of long-pedunculate microstrobili; it is distinguished by the absence of a characteristic thin indumentum of reddish brown trichomes, and green rather than greenish yellow pigmentation of the strobili. Vegetatively, *E. laurentianus* is a very different species, with much larger (up to 500 mm long and 50 mm wide) and softer-textured leaflets.

The new species resembles *Encephalartos septentrionalis* Schweinfurth (Goode, 1989: 236) by its pedunculate, ovoid megastrobili, and long-pedunculate microstrobili, but differs in the very short instead of very long (up to 300 mm) peduncled megastrobili (Goode, 1989: 239) and the glaucous green instead of greenish yellow pigmentation of the strobili. Both species tend to have a concentration of up to 4 teeth near the base of the upper margin of the leaflet, but in *E. septentrionalis* the leaflets are not overlapping but well spaced. Despite being an old species, *E. septentrionalis* is not well known, and in view of its unusually wide geographical distribution (according to the map in Stevenson et al., 1990b: 157) more than one species may be involved. In this respect it is worth noting that the very long megastrobilate peduncle depicted by Goode (1989: 239) is not mentioned elsewhere in the literature.

*Encephalartos imbricans* resembles *E. sclavoi* De Luca, Stevenson & Moretti (Stevenson et al., 1990a, b) by the ovoid, shortly pedunculate megastrobili as well as by the overlapping leaflets; it differs in that both mega- and microstrobili are green with centrally placed terminal facets on rugose megastrobilate bullae instead of orange-yellow with terminal facets of the smooth megastrobilate bullae situated toward the proximal margins of the bullae, the long (up to 300 mm) instead of very short-peduncled (20–40 mm) microstrobili, and the narrower (up to 22 mm vs. up to 40 mm) leaflets. *Encephalartos sclavoi* lacks the concentration of 3 to 4 teeth near the base of the upper leaflet margin.

Both *Encephalartos imbricans* and *E. turneri* Lavranos & Goode (Lavranos & Goode, 1985) have imbricate leaflets, but in *E. turneri* they are succubous instead of incubous (Fig. 3), they are wider



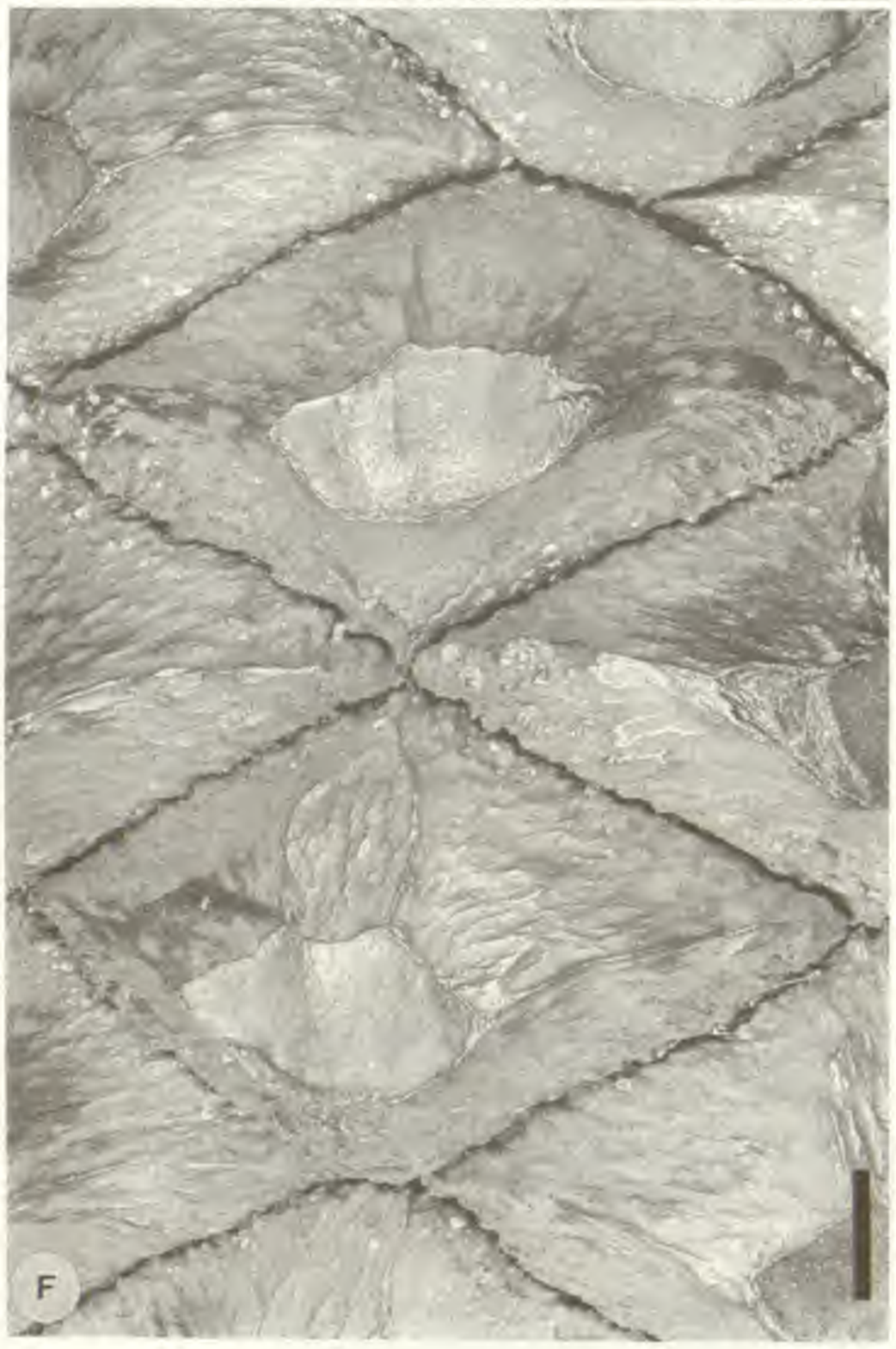



Figure 4. *Encephalartos imbricans* Vorster. —A. Microstrobilus in immature stage. —B. Portion of immature microstrobilus, showing centrally situated terminal facet. —C. Microstrobilus at anthesis. —D. Portion of microstrobilus at anthesis, showing drooping terminal facet. —E. Megastrobilus. —F. Portion of megastrobilus showing rugose facets of bullae. Scale bars (at the right in each photograph): A, C, E = 100 mm; B, D, F = 10 mm. (*Heibloem sub Vorster 3034.*)

Figure 5. *Encephalartos imbricans* Vorster. Plant in habitat, showing habit. Scale bar = 1 m.

(up to 30 mm vs. up to 22 mm), and characteristically the apices are uncinate instead of tapering to a fine point. In *E. turneri* the megastrobilus is narrowly ovoid instead of ovoid, completely sessile instead of shortly peduncled, and the bullae project more. It bears fewer microstrobili (up to 3 vs. 5–8) on shorter peduncles (up to 120 vs. to 300 mm). In both sexes the cones are not green but yellowish with a conspicuous pink bloom (Lavranos & Goode, 1985).

*Encephalartos imbricans* resembles *E. ituriensis* Bamps & Lisowski (Bamps & Lisowski, 1990) by its long-peduncled microstrobili. However, in *E. ituriensis* the megastrobilus is shortly cylindrical and the strobili of both sexes are yellow instead of green (Goode, 1989). Moreover, the type collection of *E. ituriensis* (*Lisowski 41057*, BR) leaves the impression of relatively soft textured and flaccid leaflets as in *E. laurentianus*, in marked contrast to the hard and rigid leaflets of *E. imbricans*.

Other east African arborescent species with which we compared *Encephalartos imbricans* are *E. hildebrandtii* A. Braun & Bouché (Prain, 1915; Stapf, 1914), *E. kisambo* Faden & Beentje (Faden & Beentje, 1989; Moretti et al., 1989), and *E. tegulaneus* Melville (Melville, 1957). From all these it differs by its glaucous green instead of yellow cones, and the ovoid instead of cylindrical megastrobili. Yet in various respects it resembles these species, which probably indicates a near relationship. In all four species the microstrobili are borne on very long peduncles, which can be up to 300 mm long. In both *E. imbricans* and *E. hildebrandtii* the microstrobili emerge and mature in succession rather than simultaneously. This trait is shared by the undescribed species from western Uganda, by *E. gratus* Prain (Prain, 1916) from Malawi, and *E. ferox* G. Bertoloni (pers. obs.) from southern Mozambique and South Africa, and is suspected to be present in at least some other tropical African species including *E. septentrionalis* and *E. laurentianus*. In the South African species, in the *E. manikensis* (Gilliland) Gilliland complex, the *E. poggei* Ascherson & Graebner group, and in *E. barteri* Carruthers, the cones emerge simultaneously (teste Goode, 1989; pers. obs.). The conspicuous grouping of 3 to 4 teeth near the base of the upper leaflet margin is shared by *E. hildebrandtii* (some specimens, e.g., *Faden, Faden & Rathbun 72 136*, K), *E. kisambo*, *E. tegulaneus*, *E. bubalinus* (where it is poorly expressed), the Malawian *E. gratus*, and the South African *E. woodii* Sander, and it is tempting to read phylogenetic significance in it.

Melville (1957: 248) briefly described a variety *dentatus* of *E. hildebrandtii*, based on cultivated specimens. Heenan (1977: 281–282) reported that he had rediscovered it near Jinja in Uganda. This is not the same as *E. imbricans*, because *E. hildebrandtii* var. *dentatus* is distinguished by divaricate-dentate medio-lateral ridges on both the micro- and megasporophyllate bullae.

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Figure 6. *Encephalartos imbricans* Vorster. Plants in typical habitat, wedged in crevices in granite outcrop. Scale bar = 1 m.

Literature Cited


Bamps, P. & S. Lisowski. 1990. A new species of *Encephalartos* [*E. ituriensis*] (Zamiaceae) from northeastern Zaire. Mem. New York Bot. Gard. 57: 152–155.

Bois, D. 1907. Les *Encephalartos lemarinelianus* et *laurentianus*. Rev. Hort. 79: 177–179.

Faden, R. B. & H. J. Beentje. 1989. *Encephalartos kisambo*, a new cycad from Kenya, with a note on *E. tegulaneus*. Utafiti 2: 7–10.

Gentil, L. 1904a. *Encephalartos* from the Congo. Gard. Chron., June 1904: 370–371.

———. 1904b. Les cycadées au Congo. Rev. Hort. Belge étrangère 30: 7–9.

Goode, D. 1989. Cycads of Africa. Struik Winchester, Cape Town.

Heenan, D. 1977. Some observations on the cycads of central Africa. J. Linn. Soc., Bot. 74: 277–288.

Lavranos, J. & D. Goode. 1985. *Encephalartos turneri* (Cycadaceae), a new species from Mozambique. Garcia de Orta 7: 11–14.

Lebrun, J. 1930. Note sur l'*Encephalartos laurentianus* De Wild., de la vallée du Kwango. Rev. Zool. Bot. Africaines 19: 384–390.

Melville, R. 1957. *Encephalartos* in central Africa. Kew Bull. 2: 237–257.

Moretti, A., P. de Luca, J. P. Sclavo & D. W. Stevenson. 1989. *Encephalartos voiensis* (Zamiaceae), a new east central African species in the *E. hildebrandtii* complex. Ann. Missouri Bot. Gard. 76: 934–938.

Prain, D. 1915. *Encephalartos hildebrandtii*. Bot. Mag. 141: tt. 8592 & 8593.

———. 1916. Diagnoses Africanae LXVII. Kew Bull. 7: 180–182.

Robyns, W. 1948. Cycadaceae. Pp. 1–4 *in* Flore du Congo belge et du Ruanda-Urundi, Spermatophytes, vol. 1. I.N.É.A.C., Bruxelles.

Stapf, O. 1914. *Encephalartos hildebrandtii*. Kew Bull. 10: 386–392.

Stevenson, D. W., A. Moretti & P. de Luca. 1990a. *Encephalartos sclavoi* De Luca, D. Stevenson & Moretti (Zamiaceae), a new species from Tanzania. Delpinoa, n.s. 29–30: 3–5.

———, ——— & ———. 1990b. A new species of *Encephalartos* [*E. sclavoi*] (Zamiaceae) from Tanzania. Mem. New York Bot. Gard. 57: 156–161.

Vorster, P. 1993. Taxonomy of *Encephalartos* (Zamiaceae): Taxonomically useful external characteristics. Pp. 294–299 *in* D. W. Stevenson & K. J. Norstog (editors), Proceedings of CYCAD 90, the Second International Conference on Cycad Biology, Palm & Cycad Societies of Australia, Milton, Queensland.

De Wildeman, É. 1903a. Études de systématique et de géographie botaniques sur la Flore du Bas- et du Moyen-Congo. Ann. Mus. Congo, Sér. 5, Bot. 1: 9–10, tt. 23–25.

———. 1903b. Icones Selectae Horti Thenensis 4: 183.

———. 1903c. Notices sur des plantes utiles ou intéressantes de la Flore du Congo [1]: 386–394.

———. 1907. Pp. 364–370 *in* Mission Émile Laurent. Vanbuggenhout, Bruxelles.

# *Kengyilia guidenensis* (Poaceae: Triticeae), a New Species from Western China

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ABSTRACT. *Kengyilia guidenensis*, a new species from western China, is described and illustrated. Cytological observations are provided, and comparisons with similar species are made.

During an expedition to western China, a new species of *Kengyilia* was found. It was growing on a mountain slope close to the highway from Guide to Guomaying, between the 150 and 151 Km road poles. When collected it was identified as *K. nana* J. L. Yang, Yen & Baum; however, the habitat of *K. nana* is alpine steppes above 4000 m, whereas the Guide population was found just below 3100 m altitude and in stony slopes. The habitat of the Guide population is similar to that of *K. kokonorica* (Keng) J. L. Yang, Yen & Baum, but differs by being dwarf in appearance and by having ovate, dense, small spikes. In the same site another species of *Kengyilia* was found. This was *K. mutica* (Keng ex Keng & S. L. Chen) J. L. Yang, Yen & Baum, from which it readily differs in gross morphology by its dwarf habit and by its short ovate spike with long lemma awn. *Kengyilia mutica* does not have awns, and its spike is long and cylindrical.

These preliminary observations led to the suspicion that a new species was on hand. The purpose of the present paper is to describe this species and to detail differences from the species most similar to it.

## MATERIALS AND METHODS

Herbarium specimens and seeds were collected in 1993 in Guide County, Qinghai Province, China, and compared with specimens of *Kengyilia nana* and *K. kokonorica* (including their types) in N and SAUTI. Cytological observations were made using the methods detailed in Yen and Yang (1990).

## DESCRIPTION

**Kengyilia guidenensis** Yen, J. L. Yang & Baum, sp. nov. TYPE: China. Qinghai Province: Guide County, Guide to Guomaying highway between markers 150 and 151 Km, alt. 3100 m, 35°89′N, 100°26′E, 11 Sep. 1993, *C. Yen, J. L. Yang & G. L. Sun 930001* (holotype, SAUTI; isotype, DAO). Figure 1.

*Kengyiliae kokonoricae* (Keng) J. L. Yang, Yen & Baum affinis, sed laminis superioribus albo-villosis; spicis brevioribus, 3–3.5 cm, et angustioribus, 5 mm; spiculis brevioribus, 7 mm, et plurifloribus, 5–7; glumis longioribus, 4–7 mm, lanceolatis; aristis lemmatum brevioribus, 1.5–4 mm; carinis palearum ominino ciliatis; antheris longioribus, 3 mm, differt. *Kengyiliae nanae* J. L. Yang, Yen & Baum affinis, sed culmis longioribus, 35–50 cm longis; foliorum vaginis glabris, laminis longioribus, 8.5–9 cm longis; spicis angustioribus, 5 mm latis; glumis lanceolatis; aristis lemmatum brevioribus, 1.5–4 mm longis; paleis ominino ciliatis differt.

Caespitose perennial, with fibrous roots (Fig. 1A). Culms caespitose, erect, 35–50 cm tall, 1.5 mm diam., 2–3-noded, pubescent just below the spike for 1–3 cm, geniculate at the base. Leaf sheaths glabrous, rarely pubescent in the lowermost sheaths; ligules scarious, membranous, truncate, premorse, ca. 0.5 mm long; leaf blades flat or slightly involute, narrowly lanceolate, 8.5–9 cm long, 3 mm wide, their adaxial surface with dense 1-mm-long white hairs emerging from the lateral nerves, their abaxial surface glabrous; leaf blades of the tillers densely pubescent, up to 12 cm long. Spikes erect, short and dense, ovate, 3–3.5 cm long, 5 mm wide; rachis internodes 1.5–2 mm long, densely white-pilose; spikelets oblong-ovate (Fig. 1J), greenish purple, with 5–7 florets 7 mm long (excluding awns); rachilla internodes 1–1.2 mm long, densely hirtulous; glumes unequal, wide lanceolate, with herbaceous membranous margins (Fig. 1B, C), 1(–3)-nerved, with midrib pronounced and

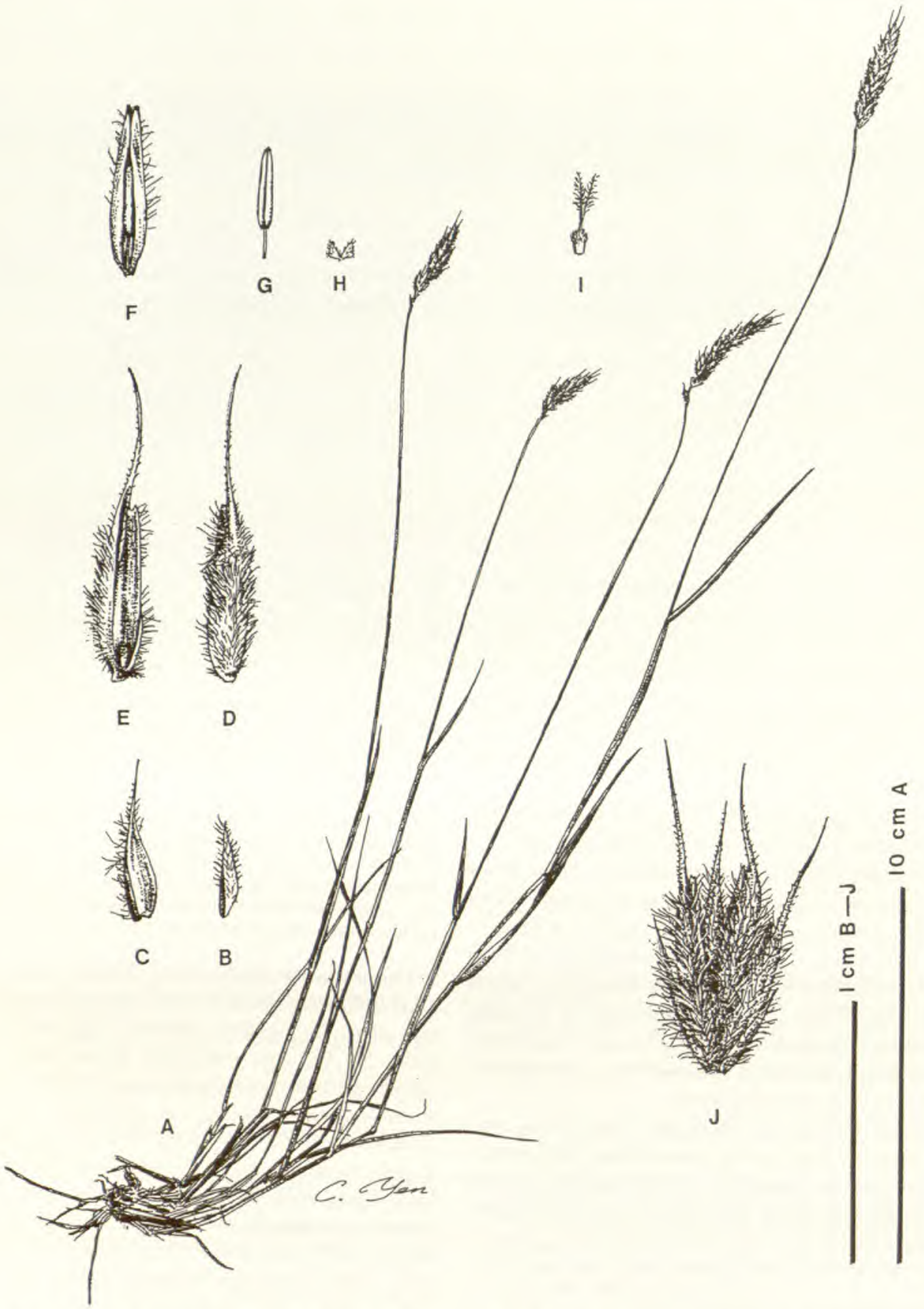


Figure 1. *Kengyilia guidenensis* Yen, J. L. Yang & Baum. —A. Plant. —B. Lower glume. —C. Upper glume. —D. Dorsal view of floret. —E. Ventral view of floret. —F. Palea. —G. Anther. —H. Lodicules. —I. Young gynoecium. —J. Spikelet.

thus appearing as keels, densely white-hirsute, acuminate or mucronate, the 1st glume 3–5 mm long, the 2nd glume 4–7 mm long; glumes of the uppermost spikelets membranous and 2-lobed, very unequal; lemmas ovate, 7–9 mm long (excluding awns), densely beset with 1-mm-long white hairs, ending with a 1.5–4-mm-long scabrous awn (Fig. 1D, E); the lowermost lemma 7 mm long; callus with 0.8-mm-long hairs on both sides; palea equal to lemma, with emarginate apex, keels ciliolate in their entire length, densely hirsute between the two keels (Fig. 1F); anthers yellow, 3 mm long (Fig. 1G). Lodicules triangular (Fig. 1H) with a distinct side lobe in their lower half. Caryopsis brown, 5 mm long.

*Kengyilia guidenensis* grows on stony slopes, between broken granite rocks, around 3100 m.

*Kengyilia guidenensis* has $2n = 42$. It carries the SPY combination of haplomes, typical of *Kengyilia* by their relative chromosome length and arm ratio (Fig. 2), similar to the karyotypes of *K. gobicola* Yen & J. L Yang (Yen & Yang, 1990), *K. habahenensis* Baum, Yen & J. L. Yang (Baum et al., 1990), and *K. nana* J. L. Yang, Yen & Baum, *K. tahelacana* J. L. Yang, Yen & Baum, and *K. zhaosuensis* J. L. Yang, Yen & Baum (Yang et al., 1992).

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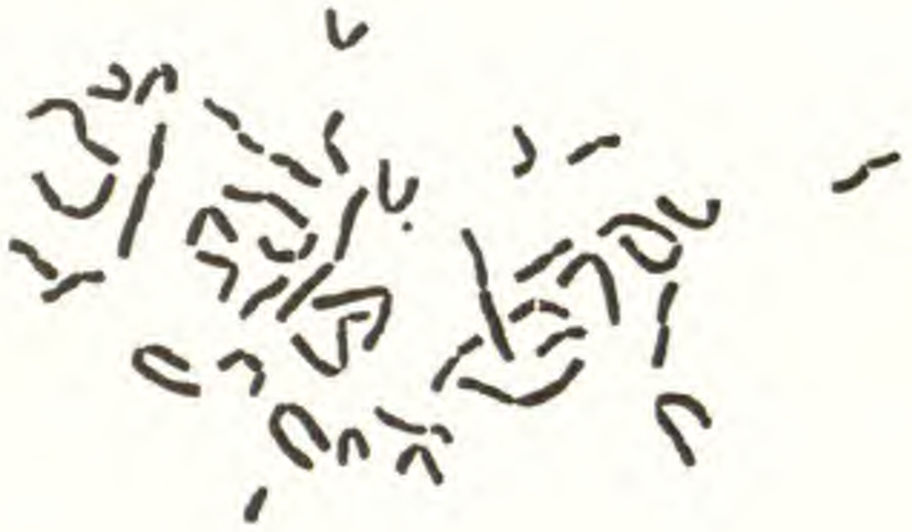

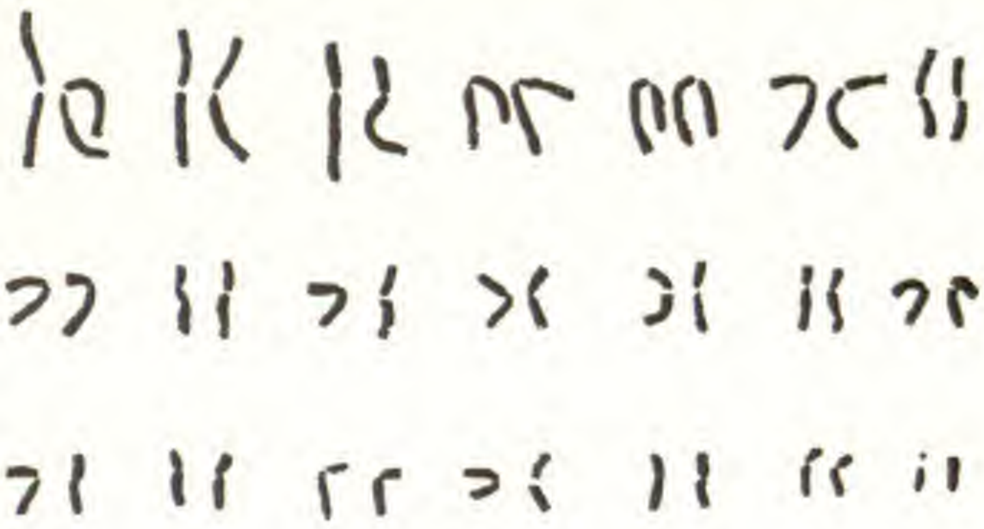

Figure 2. Karyotype of *Kengyilia guidenensis* Yen, J. L. Yang & Baum. First row illustrates the P haplome; second and third rows illustrate the S and Y haplomes mixed.

Literature Cited

Baum, B. R., C. Yen & J. L. Yang. 1990. *Kengyilia habahenensis* (Poaceae: Triticeae)—A new species from the Altai mountains, China. Pl. Syst. Evol. 174: 103–108.

Yang, J. L., C. Yen & B. R. Baum. 1992. Three new species of the genus *Kengyilia* (Poaceae: Triticeae) from West China and new combinations of related species. Canad. J. Bot. 71: 339–345.

Yen, C. & J. L. Yang. 1990. *Kengyilia gobicola*, a new taxon from West China. Canad. J. Bot. 68: 1894–1897.

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Volume 5, Number 2, pp. 119-208 of NOVON was published on 21 June 1995.

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